

APPENDIX TO APPENDIX H.

TO

SECOND REPORT OF COMMITTEE

UPON

T H E F E V E R H O S P I T A L

AND

MUNICIPAL IMPROVEMENTS:

CONTAINING

**PAPERS SELECTED FROM THE PROCEEDINGS OF THE MILITARY BOARD IN THE CANAL
DEPARTMENT, FORMING A CONTINUATION OF THOSE SELECTED FROM THE RECORDS
OF THE LATE CANAL COMMITTEE AND PRINTED IN APPENDIX (H.)**

CALCUTTA :

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1848.

APPENDIX TO APPENDIX (H)

Index.

Papers selected from the Proceedings of the Military Board in the Canal Department, forming a continuation of those selected from the Records of the late Canal Committee.—See Index to App. (H)

	PAGE.
No. 1. Letter from Secretary to Canal Committee, dated 20th December 1830, to Secretary to Military Board, transmitting the Papers &c. enumerated in the Paper marked No. 1. <i>a.</i>	Military Board's Proceedings, 21st Dec. 1830. No. 5.
No. 1. <i>a.</i> List of the Records, furniture, &c. attached to the Canal Committee's Office.	Ditto ditto, No. 6.
No. 2. Letter from Secretary to Military Board, dated 18th January 1831, No. 346, to James Prinsep, Esq. Superintendent of Canals, acquainting him that Lieut. Colonel Tickell, Superintending Engineer, Lower Provinces, has been directed to assume a general control over all works placed immediately under Mr. Prinsep's Superintendence, and that in future, Mr. Prinsep is directed to transmit all his Papers, &c., relative to the Canals through the Officer above mentioned.	Ditto, 8th Feb. 1831, No. 46.
No. 3. Letter from the Secretary to the Military Board, dated 18th January, 1831, No. 363, to Superintending Engineer, L. P., stating that Mr. James Prinsep, Superintendent of Canals, and Captain Baker, Superintendent for Iron Bridges, have been directed to transmit through him to the Board, the Correspondence, &c. connected with their respective duties; and requesting the Superintending Engineer, on returning to the Presidency, to inspect the new line of Canal from the Eshamuttee River at Hosienabad to Calcutta, and stating that the object of the Board is to ascertain, 1st. The actual state of the new line of Canals with reference to facility of Navigation, both for light and heavy Craft. 2nd. How far in its present state that line affords a communication preferable to that by the Old Route through the Soonderbuns by Tolley's Nullah, supposing that Nullah to be fully navigable. and also taking the Nullah in its present state.	Ditto ditto, No. 47.

3rd. Whether the Superintending Engineer deems it practicable to render the new line of Canal fully and freely navigable, and if so, at what scale of expense, and requesting to be furnished with any observations that the Superintending Engineer may have to offer, that may guide them in determining whether or not the work, being practicable, should be prosecuted as essentially useful, or abandoned. (Vide Paper marked No. 34.)

Military Board's
Proceedings, 8th
Feb. 1831, No. 45.

No. 4. Letter from the Military Board, dated 8th February 1831, (No. 726,) to the Honorable Vice-President in Council, submitting for the opinion of Government, whether the Board are competent to pay interest on a sum due for ground purchased for the Circular Canal, and kept in deposit in consequence of disputed Title, and transmitting copy of the Advocate General's opinion on the subject.

Ditto, 15th Feb.
1831, No. 45.

No. 5. Letter from the Secretary to the Military Board, dated 17th January, 1831, No. 322, to the Secretary of the Marine Board, and to the Master Attendant, requesting to be furnished with a Memorandum, shewing the strength of current in the Hooghly between Baloo Khal and Tolley's Nullah, or in any part of the Stream between those points during ebb spring tides at the Freshes in August and September, stating the greatest velocity of current that has been observed in miles per hour.

Ditto ditto, No. 7.

No. 6. Letter from the Deputy Master Attendant, dated 19th January 1831, to Secretary to Military Board, stating that between Baloo Khal and Tolley's Nullah, the ebb in his opinion, runs from 5 to 7 miles per hour during spring tides in the months of August and September.

Ditto ditto, No. 8.

No. 7. Letter from the Secretary to the Marine Board, dated 4th February 1831, to Secretary to Military Board, stating that the Marine Board have no means of furnishing the information required by the Military Board—but if the Military Board desire that the matter should be determined by experiment during the next Freshes, directions to that effect will be given by the Marine Board.

Ditto ditto, No. 9.

No. 8. Letter from Secretary to Military Board, dated 15th February 1831, No. 772, to the Secretary to the Marine Board, stating that the Military Board gladly avail themselves of the offer made by the Marine Board of ascertaining by experiment, the strength of current in the Hooghly between the Baloo Khal and Tolley's Nullah.

Ditto, 22nd Feb.
1831, W. W. Nos.
89 and 90.

No. 9. Minute, dated 25th January 1831, by Lieutenant Colonel Galloway, urging, with reference to the Papers marked in the Board's Proceedings as Nos. 85 to 88, printed as Nos. 128, 130, 131, in App. H. that the projection of the New Circular and Soonder-

bund Canals appear to be defective in design, that they hold out no advantages commensurate at all with the cost of the undertaking, whilst he conceives it to be attended with considerable risk of injury to the Navigation of the Hooghly below Calcutta, and by no means free from danger to that City, and recommends that the work be entirely suspended.

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| No. 10. Minute, dated | by Colonel Sir Thomas Anburey, on the above. | Military Board's
Proceedings 22nd
Feb. No. |
| No. 11. Minute by Lieutenant Colonel J. Craigie, dated 31st January 1831, urging with reference to the above, that the scheme of operations proposed by Mr. Prinsep for the present season should be approved, and more particularly that the execution of the Circular Canal should be prosecuted to completion with the utmost energy, in order that the State may as early as possible, reap the benefit to be derived from that work and from the other portions of the Eastern Canal which have been executed. | | Ditto ditto No. 91. |
| No. 12. Minute, dated 8th February 1831, by D. McFarlan, Esq. agreeing, with reference to the above, with the sentiments entertained by Colonel Craigie. | ... .. | Ditto ditto No. 92. |
| No. 13. Additional Minute by D. McFarlan, Esq., dated — with reference to the above, and transmitting the Paper marked No. 13. a. ... | | Ditto ditto No. 93. |
| No. 13. a. Note by Mr. Blechynden, Superintendent of Roads, on the effect which the admission of the River into the Mahratta Ditch would have on Calcutta. | ... .. | Ditto ditto No. 94. |
| No. 14. Additional Minute, dated 12th February 1831, by Colonel Sir Thomas Anburey, urging, with reference to the above, that the Circular Canal should be pushed on to conclusion with the utmost vigor, and that any further very expensive operations should be discontinued on the Eastern or Soondurbun Canal, without reference to any future returns or advantages therefrom. | ... .. | Ditto ditto No. 95. |
| No. 15. Letter from Secretary to Military Board, dated 22nd February 1831, No. 1037, to the Vice-President in Council, transmitting the Papers marked Nos. 9. to No. 13. a. inclusive. | ... .. | Ditto ditto No. 96. |
| No. 16. Statement of Lands, about 168 Beegahs, purchased for the Circular Canal, from the 1st October 1828. | | Ditto, 1st March
1831, No. 31. |
| No. 17. Letter from Superintendent of Canals, dated 8th February 1831, to Secretary to Military Board, returning the Paper marked No. 17. a., transmitted in his Letter of the 2nd February 1831. | | Ditto ditto No. 33. |
| No. 17. a. List of Lands, about 27 Beegahs, remaining to be purchased for | | Ditto ditto No. 32. |

- the Circular Canal, 6th January 1831, with marginal observations by the Superintendent of Canals.
- Military Board's
Proceedings, 1st.
Mar. 1831, No. No. 18. Letter from the Military Board, dated 1st March 1831, to the Hon'ble the Vice-President in Council, transmitting the Papers marked No. 16, 17, and 17. *a.*, and applying for an assignment of Rs. 1,40,000, for the purchase of Lands required for the construction of the Circular Canal.
- Ditto, 22nd March
1831, No. 31. No. 19. Letter from Secretary to Military Board, dated 22nd March 1831, No. 1325, to Superintendent of Canals, requesting him to state, according to the latest and best information in his possession, the comparative length of time required for Boats of different descriptions and burthen using sails and oars respectively, to make the passage by the Old Soondurbun and by the New Canal Routes.
- Ditto 29th March
1831 No. 9. No. 20. Letter from Secretary to Military Board, dated 15th January 1831, No. 319, to the Collector of Calcutta, requesting to be furnished with a Statement of the number of Boats which have passed through Tolley's Nullah monthly within this last year, and stating the amount of duty realized.
- Ditto ditto No 81. No. 21. Letter from Superintending Engineer, Lower Provinces, dated 16th February 1831, to Military Board, transmitting the Papers marked No. 21. *a.* and 21. *b.*
- Ditto ditto ditto. No. 21. *a.* Letter from Superintendent of Canals, dated 8th February 1831, to Superintending Engineer, L. P. reporting that a portion of the Circular Canal has been filled up to a considerable extent by the Earth washed down through the City and Narkooldangah Drains.
- Ditto ditto ditto. No. 21. *b.* Letter from the Superintendent of Canals, dated 9th February 1831, to Superintending Engineer, L. P. on the expediency of deepening the Entally Canal, where it is joined by the Circular Canal.
- Ditto ditto No. 82. No. 22. Letter from the Superintendent of Canals, dated 1st March 1831, to Superintending Engineer, L. P. stating that 200 feet of the bed of the Circular Canal has been filled up to the extent of 3½ feet by the deposit from the Bythukkhanna Drain, and that it is necessary that the deposit should be early removed.
- Ditto ditto No. 83. No. 23. Letter from the Superintendent of Canals, dated 10th March 1831, to Secretary to Military Board, stating that the Entallee Canal is choked up with deposit from the Dhurumtollah Drain to the Koolea Bridge, to an average depth of 5½ feet, or 834 chowkas, to remove which it will cost about Rs. 3,500; that if

the deposit is allowed to increase, it will impede the entrance into the Circular Canal, and cause a deposit in it; and that the Eastern Canal was cleared to a foot below the Zero on the Koolen Bridge in the year 1826, and 1827, at a cost of Rs. 4,522:14:5½ for 1182 chowkas, including the sloping of the Banks. ...

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| <p>No. 24. Letter from the Local Commissioner of Revenue, dated 25th March 1831, to the Secretary to the Military Board, transmitting copy of a Report in Bengalee from the Collector of Calcutta, complaining that much inconvenience is suffered, by the Eastern Canal not being kept properly clear, and requesting the evil may be remedied.</p> | <p>Military Board's
Proceedings, 29th
March 1831, No.
33.</p> |
| <p>No. 25. Letter from Secretary to Military Board, dated 29th March 1831, No. 1403, to Superintendent of Canals, requesting a Report, according to the latest and best information in his possession, on the number of Boats and Craft of different descriptions, which on an average pass daily or monthly through the Old Sunderbund and New Canal Routes respectively.</p> | <p>Ditto ditto No. 33</p> |
| <p>No. 26. Letter from the Collector of Calcutta, dated 29th March 1831, transmitting the Papers marked No. 26. a. and No. 26. b. ...</p> | <p>Ditto ditto, No. 10.</p> |
| <p>No. 26. a. Statements, shewing the number of Boats which have passed through Tolly's Nullah during the year 1829-30.</p> | <p>Ditto, ditto, ditto.</p> |
| <p>No. 26. b. Statement, shewing the number of Boats with Firewood which have passed through Tolly's Nullah during the year 1829-30.</p> | <p>Ditto, ditto, ditto.</p> |
| <p>No. 27. Letter from Military Board, dated 29th March 1831, No 404, to the Vice-President in Council, transmitting a copy of the Paper marked No. 23, and requesting that an assignment of Sa. Rs. 3,500 be granted to the Superintendent of Canals for deepening the Entallee Canal.</p> | <p>Ditto, ditto, No.</p> |
| <p>No. 28. Letter from the Superintendent of Canals, dated 15th April 1831, to the Secretary to the Military Board, in reply to the Papers marked No. 19. and No. 25.</p> | <p>Ditto, 3rd May
1831, No. 20.</p> |
| <p>No. 29. Letter from the Secretary to the Military Board, dated 19th April 1831, No. 1657. to Superintending Engineer, Lower Provinces, transmitting the Paper marked No. 28, and with reference to the 10th Paragraph of it, requesting him to call on the Superintendent of Canals to submit whatever further observations may have occurred to him relating to the advantages or disadvantages of the Eastern Canal.</p> | <p>Ditto, ditto, No.</p> |
| <p>No. 30. Letter from the Superintending Engineer, L. P., dated 26th April 1831, to Secretary to Military Board, in reply to the Paper marked No. 29.</p> | <p>Ditto, ditto, No. 23.</p> |

Military Board's Proceedings, 17th May 1831, No.	No. 31. Letter from the Military Board, dated 28th April 1831, No. 1803, to the Honorable the Vice-President in Council, transmitting a proposition by the Superintendent of Canals with remarks by the Chief Magistrate on the same, for erecting a *Bridge over the Circular Canal between the Maniktollah and Dum-Dum Bridges.
* Since executed. —J. M.	
Ditto, 17th May 1831, No. 19.	No. 32. Letter from Lucknoth Ghosal, dated 19th April 1831, to Secretary to Military Board, offering to pay Rs. 250 per annum, for the Farm of the Fishery of the Circular Canal from Boitaconnah to Baugbazar, whilst that Canal's communication with the River is unopened.
Ditto ditto, ditto.	No. 33. Letter from the Secretary to the Military Board, dated 19th April 1831, No. 1669, to Superintendent of Canals, transmitting for his opinion, the Paper marked No. 32.... ...
Ditto ditto, No. 61.	No. 34. Letter from Superintending Engineer, Lower Provinces, dated 19th April 1831, to Secretary to Military Board, in reply to his Letter of 18th January 1831, marked No. 3, reports on the Navigation and state of the new line of Canals, from Eshamuttee River at Hoseinabad to Calcutta.
Ditto ditto, No. 51.	No. 35. Letter from the Superintendent of Canals, dated 4th May 1831, to Secretary to Military Board, in answer to the Paper marked No. 32, recommends that the application of Lokenoth Ghosal, to Farm the Fishery of the Circular Canal be rejected; and adverts to the inconvenience and extortion resulting from farming Ferries over the Mofussil Canals.
Ditto ditto, No. 51.	No. 35½. Minute by Colonel A. Galloway, dated ... on the Paper marked No. 35.
Ditto ditto, No. 53.	No. 36. Letter from Superintendent of Canals, dated 4th May 1831, to Secretary to Military Board, transmitting the Paper marked No. 36. a. and stating with reference to the Estimate for deepening the Balliaghat Canal, which has been sanctioned, that he has been obliged to postpone the execution of that work until after the rains, as at present it would be very inconvenient to close the Dhurruamtollah Drain; that in anticipation of the Board's orders, he had cleared away the deposit from the mouths of the Boitaconnah and Narcoaldanga Drains, that through the unskillfulness of the head Bricklayers, some of the Drains at first constructed were made higher than he intended, but that as they all allow a sufficient slope from the Circular Road Drain Floors, he has not thought it necessary to alter them.
Ditto ditto, ditto.	No. 36. a. Table of the Levels of the Floors of the Town Drains towards

the Circular Canal referred to the Zero or average Level of the Salt Water Lake, as fixed by the late Superintendent.	PAGE.	Military Board's Proceedings 17th May 1831, No.
No. 37. Letter from Superintending Engineer, L. P., dated 10th May 1831, to Secretary to Military Board, transmitting the Paper marked No. 37. a.		Ditto ditto, No. 65.
No. 37. a. Letter, dated 5th May 1831, from Superintendent of Canals to Superintendent of Public Works regarding the relative advantages and disadvantages of the New Eastern Mofussil Canals.		Ditto ditto, No. 55
No. 38. Minute by Colonel A. Galloway, dated 16th May 1831, on the Paper marked No. 36. and No. 36. a.		Ditto, ditto, No.
No. 39. Letter from Secretary to Military Board, dated 17th May 1831, No. 299, to the Honorable Vice-President in Council, transmitting the Paper marked No. 37. and No. 37. a.		Ditto ditto, No. 56.
No. 40. Letter from the Military Board, dated 17th May 1831, No. 251, to the Vice-President in Council, transmitting the Paper marked No. 35½. and an Extract of the Paper marked No. 35. ...		
No. 41. Letter from Secretary to Military Board, dated 17th, May 1831, No. 300, to Superintending Engineer, Lower Provinces, stating that the Board considers his Report of the 19th April instant clear and satisfactory, and requesting him to concert with the Superintendent of Canals to take into consideration the Plan, by the late Superintendent, of manœuvering the Gates at Chitpore, and the feasibility or otherwise of constructing series of Canal Locks, capable of ensuring the ingress and egress of Craft at all times, and at all relative Levels of the Canal and River however varying.		Ditto ditto, No.
No. 42. Letter from Deputy Secretary to Government, dated 24th May 1831, to Military Board, in reply to their Letters of the 22nd February, 3rd March, and 26th April 1831, states, that the Vice-President in Council concurs in the opinion of the Majority of the Board, who are in favor of the vigorous prosecution of the Circular Canal Works; that the suggestion to leave the Eastern Canals in their present state for a year or two, in order that a more correct judgement may be formed of their success; and that the Towing paths only should be cleared and smoothed, is approved.		Ditto 7th June 1831, No. 8.
No. 43. Letter from the Superintendent of Canals, dated 30th June 1831, to Superintending Engineer, L. P., stating, with reference to the Petition relative to the Land taken for the Chytal Canal, that a remission of 8 annas rent per Biggah will be equitable.		Ditto, 12th July 1831, No. 41.

Military Board's
Proceedings, 23rd
August 1831, No.
19.

No. 44. Letter from Mr. J. Siret, dated 1st August 1831, to Military Board, offering to construct the New Road as well as side Drains and Bridges on the sides of the Circular Canal, at the following rates ; viz.

1. For laying double bricks on the centre of the Roads and single bricks on the sides, with 6 inches of koah on the top, per 0/0 feet, ... Rs. 0
Ditto single bricks, with 9 inches of koah, .. 0
For constructing Kutcha Roads on the side of the Puckah, per 0/0 feet, ... Rs. 1 0 0
Ditto making Puckah Drains on the sides and Bridges across the Roads, per 0/0 feet, ... Rs. 14 0 0

Ditto, 6th September 1831, No. 38.

No. 45. Letter from Superintending Engineer, L. P., dated 15th August 1831, to Secretary to the Military Board, transmitting the Paper marked No. 45. a.

Ditto ditto,

No. 45. a. Letter from Superintendent of Canals, dated 10th August 1831, to Superintending Engineer, L. P., reporting that the Circular Canal is now ready for the admission of Boats from the Eastward through the Salt Water Lake, drawing 4 or 5 feet of water.

Ditto ditto, No.

No. 46. Letter from the Military Board, dated 6th September 1831, No. 1850, to the Vice-President in Council, transmitting the Papers marked No. 45. and 45. a, and recommending that the Circular Canal be immediately thrown open to Navigation for all Boats, drawing from 4 to 5 feet of water—but that no Toll be levied till the communication is complete (Lieutenant Col. Galloway dissents in opinion, and recommends a Toll be levied immediately); that sale of Land be postponed for the present, but that in the meantime, the allotments may be let.

Ditto, 27th September 1831, No. 11.

No. 47. Letter from the Deputy Secretary to Government, Territorial Department, dated 13th September 1831, to Military Board, stating in reply to their letter of the 6th instant, that his Honor the Vice-President in Council is of opinion, that to admit Boats into the Circular Canal only for a short time, free of Duty, would create discontent hereafter, that the Board should take the subject of the Tolls maturely into their consideration, and propose such modifications as to them may appear necessary, and that the ground on the Banks of the Circular Canal may be leased out for periods not exceeding one year.... ..

Ditto ditto, No.

No. 48. Letter from Secretary to Military Board, dated 27th September, 1831, to Secretary to Sudder Board of Revenue, requesting the sentiments of the Board, on the revised rate of Toll which might be levied on Boats passing through Tolly's Nullah and the Circular Canal.

PAGE.

- No. 49. Memorandum by the Chief Magistrate, dated 17th October 1831, to Military Board, stating the amount of Toll to be levied at the Circular Canal being about to be settled, suggests the propriety of adopting certain measures connected with the Land on the sides of the Canal, previous to the Toll taking effect.
- Military Board's
Proceedings, 25th
October 1831, No.
28.
- No. 50. Letter from the Secretary to the Military Board, dated 25th October 1831, to Superintendent of Canals, requesting him to divide into such allotments as may appear most convenient and advantageous, the excess of ground on the sides of the Circular Canal.
- Ditto ditto, No.
- No. 51. Letter from the Military Board, dated 25th October 1831, to the Superintending Engineer, L. P., transmitting a copy of the Paper, marked No. 50.
- Ditto ditto, No.
- No. 52. Minute by D. McFarlan, Esq., dated 26th October 1831, with connected Papers with reference to the Government Order of the 30th September last, on the proposed opening of the Circular Canal, and urging that an equal Toll should be levied on Tolley's Nullah and the Circular Canal, and refers to the Government Regulation No. XVIII. of 1806, and No. VII. of 1810. ...
- Ditto 8th November 1831, No. 37.
- No. 53. Minutes on the above by the Members of the Board, approving generally of Mr. McFarlan's suggestions.
- Ditto ditto ditto.
- No. 54. Letter from the Magistrates of Calcutta, dated 2nd November 1831, to Deputy Secretary to Government, stating that the progress of the execution of the Circular Canal is about to obliterate some portions of the old Mahratta Ditch, laid down as the Legal Boundary of the Town of Calcutta under a Government Proclamation, an Extract of which, marked, No. 55. *a.* is annexed; that it is desirable that the actual limit of jurisdiction should not be uncertain and undiscoverable, that it should not be a fictitious line or a mere line on Paper, but something substantial, not liable to pass out of men's memories, or to be insensibly encroached upon by neighboring inhabitants, and that to provide against this last occurrence here, either of the following Plans would answer; viz.
- Ditto, 22nd Nov. 1831, No. 37.
- 1st. The erecting a wall on the site of the old Boundary.
- 2d. Having small Drains kept up, shewing the old channel.
- 3d. The Jurisdiction being extended to the Circular Canal under the Provision Chap. 84 of the 55 Geo. III. that for the purposes of the Police, and prevention of Smuggling, the Canal would be the best Public Boundary, though as stated for other reasons objectionable.
- No. 54. *a.* Extract of a Proclamation relative to the limits of the Town.
- Ibid.

Military Board's
Proceedings, 22nd
Nov. 1831, No. 58.

No. 55. Letter from the Deputy Secretary to Government, dated 8th November 1831, to the Justices of the Peace for the Town of Calcutta, stating, with reference to the Papers marked No. 54, and 54. *a.* that several objections exist to adopting the 3rd Plan proposed by them; that independent of those objections, the jurisdiction to be extended would require the sanction of the Court of Directors and Board of Commissioners, and consequently involve the delay of a reference to them. That the terms of the old Proclamation appear to the Honorable the Vice-President in Council to point out the most convenient method of marking the Boundary; that accordingly His Honor is prepared to sanction the expenses of a Drain and of sunken masonry marks to be constructed, as nearly as possible, identical with the present boundary and posts, or metas.

Ditto ditto, No. 22. No. 56. Letter from Deputy Secretary to Government, dated 15th November 1831, to Military Board, sanctioning the admission of Boats into the Circular Canal on Payment of a duty of 50 per cent. over and above that levied on Boats entering the Intallee Canal, under Regulation VII. of 1810, and authorizing the removal of the Toll Chowkey to the junction of the Intallee and New Circular Canal.

Ditto ditto, No. 56. No. 57. Letter from D. McFarlan, Esq. dated 19th November 1831, to Secretary to Military Board, transmitting the Paper, marked No. 54, No. 54. *a.* and No. 55, and requesting that the Superintendent of Canals may be directed to proceed agreeably with the instruction conveyed in the 5th Paragraph of the Paper marked No. 55.

Ditto ditto, No. No. 58. Letter from Secretary to Military Board, dated 22nd November 1831, to Superintendent of Canals, transmitting copies of the Papers marked No. 55 and No. 57, and requesting him to act agreeably with the instruction conveyed therein.

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Ditto ditto, 29th November 1831, No. 34. No. 59. Letter from Assistant Secretary to Sudder Board of Revenue, dated 18th November 1831, to Secretary to Military Board, stating that the Sudder Board concurs in the arrangement made for levying a temporary duty of 50 per cent. over and above the rate prescribed for the Entally Canal on all Boats entering the Circular Canal.

Ditto, 6th December 1831, No. 29. No. 60. Letter from the Superintending Engineer Lower, Provinces, dated 2nd August 1831, to Secretary to Military Board, transmitting the Papers marked No. 60. *a.* to No. 60. *a.* (14) ...

Ditto ditto, ditto. No. 60. *a.* Letter from Superintending Engineer, L.P. dated 19th April 1831, to Superintendent of Canals, adverting to their late inspection of the New Canal, requests him to furnish a Report, whether

it would be advisable to have recourse to Bunding and Chowka Work, with reference to a further employment of the Dredging Machine at the mouth of the Entallee Canal.

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| <p>No. 60 a.(1) Letter from Superintendent of Canals, dated 28th July 1831, to Superintending Engineer, Lower Provinces, in reply to his Letter of the 19th April 1831, transmits the Paper marked No. 60. a. (14). and a Table of Soundings, taken in May, and verified in June 1831, upon comparison of which with the former Soundings, it appears that the Channel has been deepened by the working of Dredging Boats $1\frac{1}{2}$ foot, that he thinks that some error, for which he cannot account, has crept into the Table of Soundings taken in 1827, since they are uniformly nearly 2 feet less than the present Soundings, even beyond the space acted on by the Dredgers; that the average depth of the Channel from Chingreeghatta Salt Works to the 2nd Chokey, or until the depth increases to 8 feet, is now 6 feet 3 inches, being 2 feet 2 inches less than the excavated depth of the Circular Canal, and that he would suggest the Dredging Boats being employed another year at the same spot.</p> | <p>Military Board's
Proceedings, 6th
December 1831,
No. 39.</p> |
| <p>No. 60. a.(14) Estimate of the probable expense of deepening the Channel at the opening of the Entallee Canal into the Salt Water Lake.</p> | <p>Ditto ditto, No. 39.</p> |
| <p>No. 61. Letter from Secretary to Military Board, dated 16th August 1831, No. 1478, to Superintendent of Canals, requesting him to state the expense likely to be incurred by Dredging to enable the Board to judge, whether that mode of excavating would not be preferable to hand digging.</p> | <p>Ditto ditto, No.</p> |
| <p>No. 62. Letter from Superintendent of Canals, dated 3rd November 1831, to Secretary to Military Board, adverting to his letter of the 4th May 1831, states, that he is prepared to commence upon the work sanctioned upon the Estimate of Rs. 3,500, for excavating the upper part of the Intallee Canal.</p> | <p>Ditto ditto, No. 33.</p> |
| <p>No. 63. Letter from E. R. Barwell, Esq., Local Commissioner, dated 28th November 1831, to the Military Board, transmitting the Paper marked No. 63. a.</p> | <p>Ditto ditto, No. 21.</p> |
| <p>No. 63. a. Letter from C. Trower, Esq., dated 2nd November 1831, to the Local Commissioner, urging the necessity of repairing the Road along the South [North] side of the Entallee Canal, leading from the Circular Road to the head of the Canal, and making a few Drains.</p> | <p>Ditto ditto, No.</p> |
| <p>No. 64. Letter from Superintendent of Canals, dated 30th November 1831, to Secretary to Military Board, recommending, with reference to the demarcation of the boundary line of the Mahratta Ditch</p> | <p>Ditto ditto, No. 24.</p> |

that a person from the Collector's Office, be deputed to point out the width of ground on either side belonging to Government.

Military Board's
Proceedings, 6th
December 1831,
No. 24.

No. 65. Letter from Superintendent of Canals, dated 1st December 1831, to Secretary to Military Board, stating, that the expense of deepening the Channel at the Upper part of the Salt Water Lake by Dredging will be more than double the cost of excavating by hand.

Ditto ditto, No.

No. 66. Letter from Secretary to Military Board, dated 6th December 1831, No. 2943, to Superintendent of Canals, transmitting the Papers marked No. 63, and No. 63. a., and requesting the Superintendent to furnish an Estimate of the Expence of repairing the Road, which runs to the Northward of that Canal, and providing the requisite number of Drains.

Ditto ditto ditto

No. 67. Letter from Secretary to Military Board, dated 6th December 1831, No. 2932, to Superintendent of Canals, authorizing his commencing on the excavation of the upper part of the Entallee Canal upon his Estimate of Sa. Rs. 3,500.

Ditto ditto ditto.

No. 68. Letter from Secretary to Military Board, dated 6th December 1831, No. 2947, to Superintendent of Canals, stating that in the absence of proof to the contrary, the Board are of opinion, that the average high water mark on both sides of the Mah-ratta Ditch, should be considered as defining the limits within which the ground of the Mahratta Ditch should be considered to belong to Government.

Ditto, 13th Dec.
1831, No. 34.

No. 69. Letter from Superintendent of Canals, dated 7th December 1831, to Secretary to Military Board, suggesting that the Committee appointed to inspect the works of the Canal be directed to report upon the state of the Bythukkhanna Bridge, and to give their opinion on the expediency of completing the Ooltadangah Bridge.

Ditto 27th Dec.
No. 1831, No. 14.

No. 70. Letter from the Superintendent of Canals, dated 2nd December 1831, to Secretary to Military Board, stating that he trusts the Board will waive the necessity of his attesting the Aumeen's Bills on honor, as he considers his signature attached to the bill sufficient for the purpose required.

Ditto ditto, No. 16.

No. 71. Letter from Superintendent of Canals, dated 12th December 1831, to Secretary to Military Board, submitting his remarks for the consideration of the Board, on the subject of the attestation desired of him, and that with reference to the explanation given by him, hopes the Board will waive the declaration required from him, or submit his case to the decision of Government. ...

	PAGE.
No. 72. Letter from Secretary to Military Board, dated 27th December 1831, No. 2973, to Superintendent of Canals, in reply to his Letter of the 2d instant, stating, that the Board cannot think that his compliance with a general and invariable rule of the Service would be derogatory to his character, and that they have no authority to exempt him from the rule.	Military Board's Proceedings, 27th December, 1831, No. 18.
No. 73. Letter from the Military Board, dated 27th December 1831, No. 3192, to the Honorable Vice-President in Council, transmitting with observations, the Papers marked No. 70. to No. 72. inclusive.	Ditto ditto, No 17.
No. 74. Minute by the Chief Magistrate, dated 1st February 1832, suggesting, that, as the Natives object to take leases for one year, the Government be written to for permission to let out the Lands on the line of the Circular Canal on leases for 5 years; the lessees being entitled to renew their pottahs on paying an increased rate.	Ditto ditto, No. 69.
No. 75. Letter from the Superintendent of Canals, dated 23d February 1832, to Secretary to Military Board, tendering his resignation to Government, but offering to complete the Circular Canal without pay, provided he is exempted from the usual Oath and Declaration.	Ditto 28th February 1832, No. 19.
No. 76. Letter from Military Board, dated 28th February, 1832, to Government, transmitting the Paper marked No. 75. and stating, that the Officer selected to succeed Mr. Prinsep, should be one of undoubted talent and experience.	Ditto ditto, No. 20.
No. 77. Letter from Military Board, dated 28th February, 1832, to the Vice President in Council, transmitting the Paper marked No. 74.	Ditto ditto, No.
No. 78. Letter from C. R. Barwell, Esq. Local Commissioner, dated 28th November, 1831, to Military Board, transmitting the Paper marked No. 78. a.	Ditto 6th March 1832, No.
No. 78. a. Letter from Collector of Calcutta, dated 2d November 1831, to the Local Commissioner, recommending with reference to the Estimate of Rs. 3,500, sanctioned for clearing out the Entallee Canal, that the Road leading from the Circular Road to the South [North] side of the Entallee Canal through the Wood Bazar should be repaired, and a few Drains made in that vicinity.	Ibid.
No. 79. Letter from Military Board, dated 6th December 1831, to Superintendent of Canals, transmitting the Paper marked No. 78. and No. 78. a.	Ditto ditto, No.

Military Board's
Proceedings, 6th
March 1832, No.

- No. 80. Letter from Superintendent of Canals, dated 27th January 1832, to Secretary to Military Board, transmitting the Papers marked No. 80. *a.* and No. 80. *b.* and submitting a revised Estimate, amounting to Rs. 11,893, for clearing the Entallee Canal and making various Improvements.
- Ditto ditto ditto. No. 80. *a.* Letter from Superintendent of Canals, dated 24th January 1832, to Collector of Calcutta, stating that he, the Superintendent, had made some additional charges to his Estimate for certain Improvements required.
- Ditto ditto, No. No. 80. *b.* Letter from the Collector of Calcutta, dated 27th January 1832, to Superintendent of Canals, dissenting with him in opinion respecting the necessity of the Improvements charged in his Estimate.
- Ditto ditto, No. 49. N. 81. Letter from Superintendent of Canals, dated 11th February 1832, to Secretary to Military Board, recommending the purchase of certain Plots of Ground at Chitpore, for depositing earth upon.
- Ditto ditto, No. No. 82. Letter from Military Board, dated 6th March 1832, to the Hon'ble Vice President in Council, with reference to the Papers marked No. 78. and No. 78. *a.* transmits the Papers marked No. 79. to No. 80. *b.* with observations thereon.
- Ditto 13th March 1832, No. 22. No. 83. Letter from J. Thomason, Esq., Deputy Secretary to Government, dated 6th March 1832, to Military Board, stating, that Government has authorized the Board to grant Leases of the Land on the Banks of the Canal for 5 years, at the expiration of which period, it will remain to be considered whether the Leases should be renewed, or the Land sold, and requesting the Board to make arrangements for the collection of the Ground Rent of such Lands as may be let, and for levying the Tolls, and transmitting the Papers marked No. 83. *a.* and No. 83. *b.*
- Ditto ditto, No. 23. No. 83. *a.* Letter from R. D. Mangles, Esq., Acting Junior Secretary to Revenue Board, dated 21st February 1832, to Deputy Secretary to Government, Revenue Department, relative to the expediency of letting the surplus grounds on the Banks of the New Circular Canal, and suggesting that a Native Ameen be employed instead of Mr. Osborne, a professional Surveyor, for measuring the Government Grounds at the Western end of the Balliaghatta Canal, which the Collector believes to be the subject of encroachment, and stating the inference drawn by the Revenue Board, is, that the Boitakhana and Circular Canal have been placed under the management of the Military Board, and noticing the difficulties arising therefrom, and transmitting Tenders for the farm of the Boitakhana Canal.

No. 83. *b.* Letter from Deputy Secretary to Government, Revenue Department, dated 6th March 1832, to the Acting Secretary to Revenue Board, stating, that every thing connected with the Disbursements and Receipts on the Circular Canal should remain under control of the Superintendent of Canals and the Military Board; that the Collector of the Tolls on the Boitakhana Canal may remain as heretofore under the control of the Collector of Calcutta; that if the removal of the Toll Chowkey sanctioned in his Letter of the 15th April 1832, should create any confusion, it need not be carried into effect; that under existing circumstances with reference to an intended alteration in the Tolls, it is not expedient to accept the offers for farming for 5 years the Boitakhana Canal; and that the Board is directed to issue the necessary orders to the Collector for measuring the Lands belonging to Government.

No. 84. Letter from Superintending Engineer, L. P., dated 7th February 1832, to Secretary to Military Board, transmitting the Papers marked No. 84. *a.* No. 84. *a.*⁽¹⁾ to No. 84. *a.*⁽⁷⁾ and stating, that in passing through the Mofussil Canals in January 1832, he found them nearly in the same navigable state as when he passed through them in April 1831, since which the Baminghatta Canal has been completed and thrown open. That, however, there are still many roots and stumps of trees in the *Hoseynabad* and *Baleygunge* Canals and in the *Dansakhal*, which from the strength of the current in those Channels render the Navigation difficult and dangerous to deeply-laden Boats; that he would recommend a strong Boat being obtained from the Harbour Master's Department, to be employed to remove the obstructions referred to; that it will be impossible to keep open the Navigation of the Circular Canal except at an enormous expense, if the City Drains are allowed to empty themselves into it; that all that can be done at present, he conceives is, to try the effect of a Dam and Weir at the mouths of all these Drains, and should they fail, the Drainage of the City must be conducted into the Lake by some other Channel; that the Special Committee of Engineer Officers having lately so fully reported on this and on every other point connected with the Circular Canal, that he has nothing further at present to add on the subject.

Ditto 3rd April
1832, No. 91.

No. 84. *a.* Letter from Superintendent of Canals, dated 7th January 1832, to Superintending Engineer, L. P., transmitting the Papers marked No. 84. *a.*⁽¹⁾ to No. 84. *a.*⁽⁷⁾ and stating, that some inconvenience has resulted from the Suspension of the system of Monthly Accounts, though in other respects that arrangement has been attended with advantage.

Ditto ditto ditto.

No. 84. *a.*⁽¹⁾ Annual Report by the Superintendent of Canals on the Canal Operations of 1830-31.

Ditto ditto, No. 95.

Military Board's Proceedings, 3rd April 1832, No. 96.	No. 84. <i>a.</i> ⁽²⁾ General Abstract of Expenses on Mofussil Canal Works, for the season 1830-31, from 1st July 1830, to 30th June 1831...
Ditto ditto, No. 97.	No. 84. <i>a.</i> ⁽³⁾ General Abstract of Circular Canal Works, for the season 1830-31.
Ditto ditto, No. 98.	No. 84. <i>a.</i> ⁽⁴⁾ Statement of the Expense of Excavating, including Contingent Charges of the Circular Canal, amounting to Sa. Rs. 1,06,921 : 6 : 1½ for 44,778 chowkas, averaging Sa. Rs. 2 : 6 : 2 per chowka, the Estimate having been Sa. Rs. 2 : 8 per chowka.
Ditto ditto, No. 99.	No. 84. <i>a.</i> ⁽⁵⁾ List of Outstanding Balances to 30th June 1831.
Ditto ditto, No. 100.	No. 84. <i>a.</i> ⁽⁶⁾ List of Boats which have passed to Calcutta through the Bahminghatta New Canal.
Ditto ditto, No.	No. 84. <i>a.</i> ⁽⁷⁾ Ditto through Tolly's Nullah.
Ditto ditto, No.	No. 85. Letter from Military Board, dated 3rd April 1832, No. 4,795, to the Honorable Vice President in Council, transmitting the Papers marked No. 84. No. 84. <i>a.</i> to No. 84. <i>a.</i> ⁽⁷⁾ inclusive, and with reference to them, state, that they think Mr. Prinsep's Report satisfactory, and that an application has been made to the Harbour Master's Department for the use of a Boat, required to remove the roots and stumps of trees in the Mofussil Canals, and that they, the Board, have authorised the construction of a Dam at the exit of one of the City Drains.
Ditto 17th April 1832, No. 40.	No. 86. Letter from Superintending Engineer, L. P., dated 28th March 1832, to Military Board, transmitting the Paper marked No. 86. <i>a.</i>
Ditto ditto, No. 41.	No. 86. <i>a.</i> Letter from Superintendent of Canals, dated 26th March 1832, to Superintending Engineer, L. P., reporting on the nature of the Soil upon which the foundation of the Chitpore Locks are to be built, ascertained by digging and boring to the depth of 70 feet, the result of which is very favorable.
Ditto 1st May 1832, No. 61.	No. 87. Letter from Secretary to Military Board, dated 12th April 1832, to Capt. F. Jenkins, requesting him to favour the Board with such observations as he may have had an opportunity of making on the state of the New Canals in the Soondurbuns and of the Entallee Canal.
Ditto ditto, No. 62.	No. 88. Letter from Capt. F. Jenkins, dated 16th April 1832, in reply to Secretary to Military Board's Letter of the 12th instant, submits his observations on the state of the New Canals in the Soondurbuns and of the Entallee Canal, and recommends the Roads on either side of the Entallee Canal to be carried

through the Salt Water Lake to Tardah, and Locks being placed at the Lake end of the Entallee Canal, and a cross Cut or Canal made to fall into Tolley's Nullah, below and near Guireahaut, and states the Commerce from the Eastward to be of great and increasing value.

- No. 89. Letter from Secretary to Military Board, dated 1st May 1832, No. 97, to the Honorable Vice President in Council, transmitting the Paper marked No. 88... ..

Military Board's
Proceedings, 1st
May 1832, No.

- No. 90. Letter from Deputy Secretary to Government, dated 24th April 1832, to Military Board, stating, that the Government concurs in opinion with the Board that Mr. Prinsep's Canal Operations for 1831-32 are satisfactory, and approves that Boats be employed to remove the roots and stumps of Trees in the Mofussil Canals, and that the object in erecting Dams and Weirs at the mouths of the City Drains is important, and requesting that the Government may be informed of the success which may attend the Dam that has been ordered to be experimentally constructed.

Ditto 8th May
1832, No. 13.

- No. 91. Letter from Deputy Secretary to Government, dated 15th May 1832, to Military Board, in reply to their letter of 28th February last, states that the Government accepts the resignation of Mr. J. Prinsep, of the Office of Superintendent of Canals, and appoints Captain Baker, to perform the duties of that office in addition to the one he at present holds on an allowance of Rs. 1,200 per mensem, and requests to know in what portions that sum can be assigned to the two employments.

Ditto 29th May
1832, No. 62.

- No. 92. Minute by the Chief Magistrate, dated 23d June 1832, stating, the necessity of employing two Chowkedars for the purpose of protecting the Government Lands on the East and West sides of the Circular Canal.

Ditto 3rd July
1832, No. 16.

- No. 93. Letter from Secretary to Military Board, dated 3d July 1832, to Chief Magistrate, sanctioning his employing two Chowkedars to prevent encroachments being made on the Government Lands on the sides of the Circular Canal.

Ditto ditto, No. 47.

- No. 94. Two Petitions, dated .. to the Military Board, complaining of the hardship of being compelled to pay double Toll on Boats entering the Circular Canal from Balleaghatta, and requesting that the Toll may be levied only once, as the persons who engaged to tenant the Land on the sides of the Canal are now unwilling to do so, on account of the double Toll. ..

Ditto 10th July
1832, No. 62.

- No. 95. Letter from Superintending Engineer, L. P., dated 14th June 1831, transmitting the Paper marked No. 95. a.

Ditto ditto No. 63.

- Military Board's
Proceedings, 10th
July 1832, No.
- No. 95. *a.* Letter from Superintendent of Canals, dated 5th June 1831, to Superintending Engineer L. P., reporting on the effects likely to be produced on the Drainage of Calcutta by the opening of the Circular Canal, and stating, that no danger is to be apprehended from the Lock Passage during the rains, as the Locks can either be closed or kept open as occasion may require.
- Ditto ditto, No. 64. No. 96. Minute by Lieutenant Colonel Galloway, dated 13th July 1831, on the Paper marked No. 95. *a.* and referring to Proceedings of the 17th May 1831.
- Ditto ditto, No. 68. No. 97. Letter from the Superintendent of Canals, dated 17th December 1831, to Secretary to Military Board, transmitting an Estimate for constructing a double Lock Passage for the Circular Canal, and a Plan of the modification which he proposes to introduce in Captain Prinsep's design for the Chitpore Lock Gates.
- Ditto ditto, No. 69. No. 98. Letter from Secretary to Military Board, dated 17th January 1832, to Superintending Engineer, L. P., transmitting a Memoir by the late Captain Prinsep and its connected Papers, and requesting a Report on the best means of effecting a communication between the Canal and River, combining utility with economy.
- Ditto ditto, No. 70. No. 99. Letter from Superintending Engineer, L. P., dated 29th February 1832, to Secretary to Military Board, stating, that he has communicated with Captain Forbes on the subject of the Secretary's Letter of the 17th January last, who agrees with him in opinion, as to the necessity of constructing a Lock at Chitpore, as originally intended by the late Captain Prinsep, and transmitting the Papers marked Nos. 99. *a.* to No. 99. *δ*½. inclusive.
- Ditto ditto, No. 71. No. 99. *a.* Letter from Superintending Engineer, L. P., dated 2d Feb. 1832, to the Superintendent of Canals, requesting his opinion:—
1. Whether there is a necessity for the Lock at Chitpore, and whether any inconvenience or danger would result were a secure entrance Channel, equal in area of the chamber to the intended Lock, left open to the Hooghly. 2. Should he have any doubts on the above, could he conduct during the ensuing rainy season such a set of experiments as would afford sufficient data for estimating the effects that such an influx of water would produce on the Canal and its Banks, on the Level of the Salt Water Lake, and on the Property adjacent to it and the line of Canal. 3. Whether he thinks the Navigation between the Canal and River could be maintained by means of the Log Dams, &c. without the intervention of Locks.

4. Whether he considers the Lock proposed, could have its foundation laid on the sandy soil at Chitpore at the depth planned, 44 feet below the surface, without the aid of a powerful Steam Engine.
- No. 99. *b*. Letter from the Superintendent of Canal, dated 11th February 1832, to Superintending Engineer, replying to the Paper marked No. 99. *a*. Military Board's Proceedings, 10th July 1832, No. 71
- No. 99. *b*₂. Letter from ditto, dated 22d February 1832, to ditto, in continuation of his Letter of the 11th February 1832, marked No. 99. *b*. Ditto ditto ditto
- No. 100. Letter from the Secretary to the Military Board, dated 13th December 1831, to Colonel T. Wood, Major Irvine, and Captain Forbes, appointing them a Committee for the purpose of examining and reporting on the state of the Circular Canal and its Bridges, &c., and whatever may appear to them deserving of notice in respect to the Canal generally. Ditto ditto, No. 72.
- No. 101. Letter from the Committee appointed to Report on the works of the Canal Department, dated 23d January 1832, to Secretary to Military Board, reporting on the several works of the Canal Department, and transmitting an Estimate of the quantity of soil deposited in the Canal during the rains of 1831, by the City Drains. Ditto ditto, No. 74.
- No. 102. Minute by Lieutenant Colonel Galloway, dated 23d March 1832, relative to the Chitpore Lock. Ditto ditto, No. 75.
- No. 103. Letter from Military Board, dated 12th April 1832, to the Honorable Vice President in Council, transmitting the Papers marked Nos. 95. and 95. *a*. No. 97. 99. 99. *a*. to No. 99. *b*₂. inclusive and No. 101. relative to a modification in the Locks originally planned for the Circular Canal, and to the great inconvenience resulting from the mud deposited in the Circular Canal by the City Drains. Ditto ditto, No. 76.
- No. 104. Letter from Secretary to Military Board, dated 29th March 1832, to Superintending Engineer, L. P., in reply to his Letter of the 29th ultimo, (marked No. 99.) states, that there are several objections to the Plan for the substitution of one Lock of 30 or 32 feet breadth for the purpose of admitting Steamers into the Circular Canal, and requesting an Estimate for a Suspension Bridge to be substituted for Draw Bridges. Ditto ditto, No. 77.
- No. 105. Letter from the Deputy Secretary to Government, 3d July 1832, to Military Board, sanctioning the construction of a single Lock Passage to the Circular Canal at a cost of 50,000 Rupees, and transmitting the Paper marked No. 105. *a*. Ditto ditto, No. 78.

- Military Board's Proceedings, 10th July 1832, No. 79.
- * Printed in Appendix I. page 35. J. M.
- Ditto ditto, No. 80.
- Ditto 17th July 1832, No. 60.
- Ditto 24th July 1832, No. 33.
- Ditto ditto ditto.
- Ditto 7th August 1832, No. 11.
- Ditto ditto, No. 12.
- Ditto ditto, No. 19.
- Ditto ditto, No.
- No. 105. *a.* *Letter from the Secretary to the Governor-General, Simlah, dated 12th June 1832, to Deputy Secretary to Government, Revenue Department, in reply to his Letter of 8th ultimo, relative to the Circular Canal.
- No. 106. *Letter from Secretary to Military Board, dated 10th July 1832, to Superintending Engineer, L. P., informing him that the Government have authorized the construction of the Lock at Chitpore, and that the mode of removing the soil deposited in the Canal by hand labour is approved.
- No. 107. Letter dated 12th July, from Totaram Bessis and others, offering to farm the Canal from Hosenabad to Bhaminghatta... ..
- No. 108. Letter from Superintending Engineer, L. P., dated 23d July 1832, to Secretary to Military Board, transmitting the Paper marked No. 108. *a.*
- No. 108. *a.* Letter from Superintendent of Canals, dated 20th July 1832, to the Superintending Engineer, L. P., in reply to his Letter of —, reports that the Lock Gate at Chitpore may be ready by the 1st of March 1833.
- No. 109. Letter from Superintending Engineer, L. P., dated 28th July 1832, to Secretary to Military Board, transmitting the Paper marked No. 109. *a.* and No. 109. *b.*, and recommending the construction of an Iron Suspension Bridge of 100 feet span over the Lock at Chitpore.
- No. 109. *a.* Letter from Superintendent of Canals, dated 25th July 1832, to Superintending Engineer, L. P., suggesting that the Suspension Bridge over the Lock at Chitpore be of a single span of 100 feet, which will permit the working of counterpoise levers for manœuvring the gates if found necessary to apply them, and allow a clear wharf for tracking boats through, and to lighten them if necessary, or for other purposes; that the difference of expense between the above and making one of three short spans with piers resting upon the walls of the Lock, would be about Rupees 4,500.
- No. 109. *b.* Letter from the Agent of the Iron Suspension Bridges, dated 23d July 1832, to Superintending Engineer, L. P., stating, that the probable expense for constructing an Iron Suspension Bridge of 100 feet span, and 22 feet width, over the Locks at Chitpore, and allowing a clear space of 33 feet for working Levers, &c. on each side between the piers, would be Rs. 19,500, or with contracted span with 3 curves, Rs. 15,500.
- No. 110. Letter from Secretary to Military Board, dated 7th August 1832, to Superintending Engineer, L. P., approving of the

Plan of an Iron Suspension Bridge of 100 feet span over the
Chitpore Lock.

- No. 111. Letter from Superintending Engineer, Lower Provinces, dated 15th August 1832, to Secretary to Military Board, transmitting the Paper marked No. 111. *a.* and recommending that the Level of the large Tank adverted to in the 3rd Para. of that Paper be lowered by means of a Pucka Drain leading into the Canal.
- Military Board's
Proceedings, 4th
September, 1832,
No. 26.
- No. 111. *a.* Letter from Superintendent of Canals, dated 13th August 1832, to Superintending Engineer, Lower Provinces, reporting the injury caused by the late heavy rain on the 6th, 7th and 8th instant, to the Northern Bank of the Entallee Canal, between the Dhurumtollah Drain and the Koolya Bridge, as also to the New Lock under construction at Chitpore.
- Ditto ditto, No. 27.
- No. 112. Letter from Lieutenant Col. R. Tickell, Superintending Engineer, L. P., dated 27th August 1832, to Secretary to Military Board, in reply to his Letter of the 14th instant, relative to two Bills by Mr. J. Prinsep for clearing out the Entallee Canal, and repairing the Roadway of the Koolya Bridge, and reports his inspection of those works.
- Ditto ditto, No. 13.
- No. 113. Letter from Military Board, dated 4th September 1832, No. 1927, to the Honorable Vice-President in Council, transmitting the Papers marked No. 111. and No. 111. *a.*
- Ditto ditto, No.
- No. 114. Letter from Secretary to Military Board, dated 4th September 1832, to the Superintending Engineer, L. P., stating, that Mr. J. Prinsep's two bills adverted to in the Paper marked No. 112. have been passed this day by the Board, and transmitted to the Accountant General for adjustment.
- Ditto ditto, No.
- No. 115. Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 10th December 1832, to Secretary to Military Board, in reply to his letter No. 3098, of the 4th of the same month, transmits an Estimate for constructing the Pucka Drain on the side of the Old Marhatta Ditch at Chitpore, with a Plan.
- Ditto 29th January
1833, No. 87.
- No. 116. Letter from Superintending Engineer, L. P., dated 27th February 1833, to Secretary to Military Board, with reference to the Paper marked No. 110. transmits the Paper marked No. 116. *a.*
- Ditto 5th March
1833, No. 54
- No. 116. *a.* Letter from Captain Fitzgerald in charge of the Iron Bridge Department, dated 26th February 1833, to Superintending Engineer, L. P., intimating that the foundations of the Piers of the Bridge over the Chitpore Lock require to be carried
- Ditto ditto, ditto.

	to the depth of 24 feet instead of 12, as proposed by Captain Baker.
Military Board's Proceedings, 5th Mar. 1833, No. 55.	No. 117. Letter from Secretary to Military Board, dated 5th of March 1833, to Superintending Engineer, L. P., stating that Captain Fitzgerald is authorized to carry the foundations of the Chit-pore Lock to the depth proposed.
Ditto, 19th March 1833, No. 61.	No. 118. Letter from Superintending Engineer, L. P., dated 8th March 1833, to Secretary to Military Board, adverting to the above two Papers, transmits a Rough Sketch, shewing the comparative depth of the foundation as originally intended by Captain Baker, and as now proposed by Captain Fitzgerald with remarks.
Ditto 30th April 1833, No. 4.	No. 119. Letter from Secretary to Government, dated 23d April 1833, to Military Board, transmitting the Paper marked No. 119. a.
Ditto ditto, ditto.	No. 119. a. Extract—Proceedings of the Right Honorable the Governor General in Council in the Revenue Department, under date the 19th April 1833,—to Captain J. Thomson, Engineers, appointing him Agent for the construction of Iron Suspension Bridges and the Superintendent of the Circular and Eastern Canals.
Ditto ditto, No. 42.	No. 120. Letter from Superintending Engineer, L. P., dated 25th April 1833, to Secretary to Military Board, reporting that Captain Thomson of Engineers, received charge of the Offices of the Agent for Iron Suspension Bridges and Superintendent of Canals on the 19th instant.
Ditto 3rd May 1833, No. 47.	No. 121. Letter from Superintending Engineer, dated 27th February 1833, to Secretary to Military Board, transmitting the Papers marked No. 121. a. to No. 121. a. ⁽⁶⁾ inclusive.
Ditto ditto, No. 48.	No. 121. a. Annual Report on Canal operations during the year 1831-32, by Mr. J. Prinsep, late Superintendent of Canals.
Ditto ditto, No. 49.	No. 121. a. ⁽¹⁾ Statement of the costs of the Burrisal Lime, forwarded by Captain Murray.
Ditto ditto, No. 50.	No. 121. a. ⁽²⁾ List of Outstanding Canal Balances to 30th June 1832.
Ditto ditto, No. 51.	No. 121. a. ⁽³⁾ General Abstract of Circular Canal Works, from 1st of July 1831 to 30th June 1832.
Ditto ditto, No. 52.	No. 121. a. ⁽⁴⁾ General Abstract of Expenses on Mofussil Canal Works, from 1st July 1831 to 30th June 1832.

	PAGE.
No. 121. <i>a.</i> ⁽⁵⁾ Statement of mud deposited in the Intally Canal from Dhurumtollah Drain to the Koolea Bridge in 1832.	Military Board's Proceedings, 3rd May 1833, No. 53.
No. 121. <i>a.</i> ⁽⁶⁾ Table, shewing the mud deposited in the Circular Canal between Bytuckhana and Manicktollah.	Ditto ditto, No. 54.
No. 122. Letter from Military Board, dated 3d May 1833, No. 11, to the Governor General in Council, transmitting with observations the Papers marked No. 121. No. 121. <i>a.</i> ⁽¹⁾ to No. 121. <i>a.</i> ⁽⁶⁾ inclusive.	Ditto ditto, No.
No. 123. Letter from Secretary to Military Board, dated 3d May 1833, to Superintending Engineer, L. P., transmitting a Copy of the Paper marked No. 121. <i>a.</i> and stating that Captain Thomson has assumed charge of the Circular and Eastern Canals. ..	Ditto ditto, No.
No. 124. Letter from Superintendent of Canals, (Mr. J. Prinsep), dated 24th December 1832, to Secretary to Military Board, reporting the completion of the repair of the Bhytuckhanna Bridge Piers, the Road through the Wood Bazar, and along the banks of the Entallee Canal, and the continuation of the Road from Manicktollah Bridge to Dum-Dum Bridge, and applying for a Committee to inspect the same previous to transmitting his Bills.	Ditto 17th May 1833, No. 46.
No. 125. Letter from Lucknath Ghosaul, dated 17th June 1833, to Military Board, offering 450 Rs. per annum for the farm of the Fishery of the Circular Canal.	Ditto 18th June 1833, No. 16.
No. 126. Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 22d June 1833, to Secretary to Military Board, reporting that the Lock Gates at Chitpore are ready for the passage of Boats, and noticing the intention of the Governor General to visit them on Monday morning at 6 P. M.	Ditto 28th June 1833, No. 23.
No. 127. Letter from Captain F. Jenkins, dated 29th June 1833, to Secretary to Military Board, in reply to his Letter of the 25th instant, No. 904, submits his observations and suggestions on the Eastern Canals.	Ditto 16th July 1833, No. 22.
No. 128. Letter from Military Board, dated 16th July 1833, No. 1,241, to the Governor General in Council, transmitting the Paper marked 127.	Ditto ditto, ditto.
No. 129. Letter from Secretary to Military Board, dated 16th July 1833, No. 1,243, to Superintendent of Canals, transmitting the Paper marked No. 127. and requesting his attention to the several suggestions contained therein respecting the Improvement of the Canals.	Ditto ditto, ditto.

Military Board's Proceedings, 9th August 1833, No. 16.	No. 130. Letter from Superintendent of Canals, (Captain J. Thomson,) dated 24th July 1833, to Secretary to Military Board, in reply to his Letter No. 1243, of the 16th July instant, states that the suggestion in Captain Jenkins' Report (see Paper marked No. 127.) on the Eastern Canal for a continued Tracking Ground and Road along the whole line of the Canals is quite impracticable; that the expense of forming Tracking Paths of even one-half the dimensions proposed by Captain Jenkins, would far exceed any advantage arising from them; and that the Canals are more than sufficient for the intercourse with the adjoining Country, even supposing every Beegah of it under cultivation.
Ditto 10th Sept. 1833, No. 19.	No. 131. Letter from Superintending Engineer, L. P., dated 8th June 1833, transmitting the Paper marked No. 131. a.
Ditto ditto, No. 20.	No. 131. a. Letter from Superintendent of Canals, dated 5th June 1833, to Superintending Engineer, L. P., submitting certain suggestions on points connected with the Tolls and Regulation of the Canals under his, the Superintendent's charge, and commenting on the Toll Regulations No. XVIII. of A. D. 1806, No. VII. of 1810, and No. VIII. of 1824.
Ditto ditto, No. 21.	No. 132. Letter from Superintending Engineer, L. P., dated 15th June 1833, to Secretary to Military Board, transmitting the Paper marked No. 132. a.
Ditto ditto, ditto.	No. 132. a. Letter from Superintendent of Canals, dated 11th June 1833, to the Superintending Engineer, L. P., relative to the efficient protection of the Government Lands on the banks of the Canal.
Ditto ditto, No. 23.	No. 133. Letter from Superintending Engineer, L. P., dated 2d July 1833, to Secretary to Military Board, in reply to his Letter No. 12 of 3rd May, instant, transmits the Papers marked No. 133. a. and No. 133. a.(1) to No. 133. a.(4) inclusive.
Ditto ditto, No. 24.	No. 133. a. Letter from Superintendent of Canals, dated 18th June 1833, to Superintending Engineer, L. P., transmitting the Papers marked No. 133. a.(1) to No. 133. a.(4), and reporting on the general state of the Canals and the works connected with them, with suggestions for their improvement.
Ditto ditto, ditto.	No. 133. a.(1) Rough Plan of the Proposed Cess Pools.
Ditto ditto, ditto.	No. 133. a.(2) Comparative Estimate of Dredging up the sediment from the Circular and other Canals by Steam Dredgers and hand labour
Ditto ditto, ditto.	No. 133. a.(3) Section of the Circular Canal Basin.

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No. 133. <i>a.</i> ⁽⁴⁾ Table shewing the Soundings of the Canal from the Lock at Chitpore to the Eshamuttee or Juboona River at Husseina-bad. 	Military Board's Proceedings, 10th September 1833, No. 24.
No. 134. Letter from Superintending Engineer, L. P., dated 16th July 1833, to Secretary to Military Board, transmitting the Papers marked No. 134. <i>a.</i> and No. 134. <i>a.</i> ⁽¹⁾	Ditto ditto, No. 25.
No. 134. <i>a.</i> Letter from Superintendent of Canals, dated 10th July 1833, to Superintending Engineer, L. P., transmitting the Paper marked No. 134. <i>a.</i> ⁽¹⁾ and remarking on the velocity of current in the Circular Canal, and its consequences. 	Ditto ditto, ditto.
No. 134. <i>a.</i> ⁽¹⁾ Section of the Tides at High Water in the Circular Canal.	Ditto ditto, ditto.
No. 135. Minute dated 9th August 1833, by D. McFarlan, Esq. on the Papers marked No. 131. to No. 132. <i>a.</i> inclusive. 	Ditto ditto, No. 26.
No. 136. Minute dated 18th August 1833, by Colonel J. Craigie on the Papers marked No. 133. No. 133. <i>a.</i> to No. 133. <i>a.</i> ⁽⁴⁾ inclusive.	Ditto ditto, No. 27.
No. 137. Letter from Superintending Engineer, L. P., dated 19th August 1833, to Secretary to Military Board, transmitting the Paper marked No. 137. <i>a.</i>	Ditto ditto, No. 28.
No. 137. <i>a.</i> Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 12th August 1833, to Superintending Engineer, L. P., stating the Establishment that is necessary for the working of the Lock Gate at Chitpore, and the amount of Toll which should be levied on Boats entering the Circular Canal. ..	Ditto ditto, No. 28 <i>a.</i>
No. 138. Letter from Military Board, dated 10th September 1833, to Governor General in Council, transmitting the Papers marked No. 131. No. 131. <i>a.</i> No. 133. No. 133. <i>a.</i> to No. 133. <i>a.</i> ⁽¹⁾ inclusive, and No. 134. No. 134. <i>a.</i> and No. 134. <i>a.</i> ⁽¹⁾ also No. 137. and No. 137. <i>a.</i>	Ditto ditto, No.
No. 139. Letter from Military Board, dated 10th September 1833, to Captain Thomson, Captain Fitzgerald and J. Prinsep, Esq., requesting them to form themselves into a Committee, and report on the construction of a Cess Pool, and the slope to be given to the banks of the Canal. 	Ditto ditto, No.
No. 140. Letter from Military Board, dated 10th September 1833, No. 2198, to Superintending Engineer, L. P., in reply to his letter of 2d July last, marked No. 133. 	Ditto ditto, No.
No. 141. Letter from Military Board, dated 10th September 1833, to J. Prinsep, Esq., requesting him to put Captain Thomson in	Ditto ditto, No.

possession of all the Plans and Drawings connected with the Canals, and that the Board think it desirable that Mr. Prinsep should retain charge of the Canal West of the Barrackpore Bridge, till the Locks and the Road to the Bridge are finished.

Military Board's
Proceedings, 17th
September 1833,
No. 42.

No. 142. Letter from Superintending Engineer, L. P., dated 27th July 1833, to Secretary to Military Board, transmitting a Bill amounting to Rs. 442, for clearing roots, &c. from the Mofussil Canals, from May to September 1832.

Ditto 27th Sept.
1833, No. 35.

No. 143. Letter from Superintending Engineer, L. P., dated 9th July 1833, to Secretary to Military Board, with advertence to Board's Letter of the 4th September last, transmits the Paper marked No. 143. a.

Ditto ditto, ditto.

No. 143. a. Letter from J. Prinsep, Esq. late Superintendent of Canals, dated 7th June 1833, to Superintending Engineer, L. P., transmitting a Bill for making Puckah the Road and Drains along the North side of the Intally Canal, from its junction with the Circular Canal to the mouth of the Dhurrumtollah Drain, including a Road through the Wood Bazar to the Circular Road.

*Military Board's
Proceedings 27th
Sept. 1833.

No. 143½. * * * * *

Military Board's
Proceedings, 4th
Oct. 1833, No. 8.

No. 144. Letter from Secretary to Government, dated 24th September 1833, to the Military Board, in reply to their Letter No. 2202, of 10th instant, stating that the Government approves of the suggestions &c. relative to the present state and future management of the Circular and Mofussil Canals with reference to the Reports of the Superintending Engineer, L. P., and the Superintendent of Canals.

Ditto ditto, ditto.

No. 145. Letter from Secretary to Military Board, dated 4th October 1833, to Superintendent of Canals, stating that Government having called on the Sudder Board of Revenue to suggest arrangements for the Superintendence of the duties connected with the Tolls, and letting of the Land on the Banks of the Canal; he, the Superintendent, is requested to afford the Revenue Board such information as he may be able to give. ..

Ditto 1st Novem-
ber 1833, No. 9.

No. 146. Letter from Superintending Engineer, L. P., dated 18th October 1833, to Secretary to Military Board, transmitting the Paper marked No. 146. a.

* NOTE.—Amongst the Proceedings of this day, are Papers relative to the Drainage of the Salt Water Lake, transmitted by the private Secretary to the Governor General, Lord W. C. Bentinck—Copies of these Papers have already been printed by the Committee. See Appendix G. page 1 to 29 inclusive. See also pages 30 to 57 of the same Appendix, where the Papers of the Military Board's Proceedings of 7th February 1834, on the same subject will be found printed.—J. M.

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No. 146. <i>a.</i> Letter from Superintendent of Canals, dated 8th October 1833, to Superintending Engineer, L. P., submitting a proposition for building up the mouths of the General Cross Drains leading into the principal Drains between the Canal and Circular Road.	Military Board's Proceedings, 1st November 1833, No. 10.
No. 147. Letter from Superintending Engineer, L. P., dated 27th November 1833, to Secretary to Military Board, applying for an advance on account of repairing the Narculdangah and Manicktollah Suspension Bridges, and making Tow-paths along the Sunderbund Canal, and constructing the Drains to the New Puckah Road of the Circular Canal.	Ditto 3rd December 1833, No. 29.
No. 148. Letter from Superintending Engineer, L. P., Lieutenant Colonel R. Tickell, dated 16th October 1833, to Secretary to Military Board, transmitting the Paper marked No. 148. <i>a.</i>	Ditto ditto, No. 35.
No. 148. <i>a.</i> Report dated 8th October 1833, by J. Prinsep, Esq. Superintendent of Canals, on the accident that occurred to the Chitpore Lock Gate on 28th September instant.	Ditto ditto, No. 36.
No. 148. <i>a.</i> ⁽¹⁾ Report by Overseer J. Bedford, on the accident to the Chitpore Lock Gate.	Ditto ditto, ditto.
No. 149. Letter from Secretary to Military Board, dated 25th Oct. 1833, to Superintendent of Canals, Captain J. Thomson, requesting him to report on the effect the admission of the current from the River, caused by the accident to the Chitpore Lock Gate on the 28th September instant, had on the Circular Canal. ..	Ditto ditto, ditto.
No. 150. Report dated 12th Nov. 1833, by the Superintendent of Canals, Captain J. Thomson, on the admission of the current from the River caused by the accident to the Chitpore Lock Gate. ..	Ditto ditto, No. 37.
No. 151. Letter from Secretary to Military Board, dated 3d December 1833, to Superintendent of Canals, stating, that if the Section of the Balliaghat Canal is not equal to that of the Circular Canal, it appears to the Board, that the clearing away of Bunds in the Circular Canal, and the removal of deposit in it ought to be contemporaneous with the widening and deepening of the Balliaghat Canal, and requests the opinion of the Superintendent on the above points.	Ditto ditto, No. 38.
No. 152. Letter dated 22d November 1833, from Superintendent of Canals, to Secretary to Military Board, in reply to his Letter of the 25th ultimo, marked No. 149.	Ditto ditto, No. 39.
No. 153. Letter from Military Board, dated 3d December 1833, No. 3479, to the Governor General in Council, transmitting the Papers marked No. 148. to No. 152. inclusive.	

Military Board's Proceedings, 3rd December 1833, No.	No. 154. Letter from Secretary to Military Board, dated 3d December 1833, No. 3480, to Superintendent of Canals, authorizing the clearing of the Bunds in the Circular Canal, referred to in his Letter of the 22d November 1833, at an expense of Rs. 2,000, and requesting an Estimate of the expense of making the Section of the Balliaghat Canal equal to that of the Circular Canal.
Ditto 6th Decem- ber 1833, No. 10.	No. 155. Letter from Superintending Engineer, L. P., to Secretary to Military Board, dated 28th November 1833, reporting that Captain J. Thomson received charge of the Chitpore Locks and the West end of the Circular Canal from Mr. J. Prinsep on the 18th instant, and suggesting alterations in the windlasses for opening and shutting the Lock Gates.
Ditto 31st Decem- ber 1833, No. 7.	No. 156. Letter from Secretary to Government, dated 23d December 1833, to Military Board, authorizing an advance of Rs. 1,975, for excavating the Bed of the Circular Canal.
Ditto, 17th Janu- ary 1834, No. 22.	No. 157. Letter from Superintending Engineer, L. P., dated 28th Decem- ber 1833, to Secretary to Military Board, transmitting the Paper marked No. 157. a.
Ditto ditto, No. 23.	No. 157. a. Statement of former, present, and proposed Establishments at- tached to the Canal and Iron Bridge Department, by Superin- tendent of Canals, dated 19th December 1833.
Ditto ditto, ditto.	No. 158. Letter from Secretary to Military Board, dated 17th January 1834, to Superintending Engineer, L. P., stating, that the Board approve of the Establishments fixed by the Superin- tendent in both the Departments under his charge.
Ditto, 7th February 1834, No. 58.	No. 159. Letter from Superintending Engineer, L. P., dated 23rd No- vember 1833, to Secretary to Military Board, transmitting Mr. Prinsep's Bill for expense incurred on account of Grounds purchased from May to August 1833.
Ditto, 14th Febru- ary 1834, No. 34.	No. 160. Letter from Superintending Engineer, L. P., dated 28th De- cember 1833, to Secretary to Military Board, transmitting the Paper marked No.
Ditto ditto, ditto.	No. 160. a. Letter from the Superintendent of Canals, dated 9th Decem- ber 1833, to Superintending Engineer, L. P., transmitting, with reference to the Board's Letter of the 10th September 1833, an Estimate of the expense of constructing the Embankment, and executing the Basin referred to in the 19th and 20th para- graphs of his, the Superintendent's, Report on the Canals, and stating, that the effect of closing up the Nullahs and forming the Embankment, will be to cause a strong Current into the

Lake past Balliaghatta, which will, in a few months, make a Channel 9 or 10 feet deep ; that it is not intended that all the Nullahs connecting the South-west Lake Channel should be closed up, because the proposed opening at Balliaghaut would be insufficient to drain the Lake of rain water. It is therefore proposed to close up the connecting Nullahs in succession, until a Current of 3 or 4 feet per second is got through the Channel at Balliaghatta. The Current at present does not exceed 9 inches per second. If the Lake is at any future period Drained, the proposed tow-path will have to be raised $1\frac{1}{2}$ feet, at a very trifling expense, and no alteration whatever would probably be required to the proposed Basin and Docks. . . .

- No. 161. Letter from the Military Board, dated 14th February 1834, to the Vice President in Council, transmitting the Papers marked No. 160. and No. 160. a., and stating, that the Bunding work referred to in the Superintendent of Canal's Letter, will probably afford some criterion of the expense of the Bunding work that will be required in Draining the Salt Water Lakes, and may be considered the first step in that work. Lieut. Col. Galloway does not recommend this Estimate, because in the event of warping the Lake, the Bund-work estimated for, will not, in Col. G.'s opinion, be at all required, and refers to his Minute on the Draining of the Lake, submitted with the Board's Letter to Government of the 7th February 1834. . . .
- Military Board's
Proceedings, 14th
Feb. 1834, No.
- No. 162. Letter from Superintending Engineer, L. P., dated 19th February 1834, to Secretary to Military Board, in reply to his Letter of the 3rd December 1833, to Superintendent of Canals, transmits a copy of the Paper marked No. 161. a. . . .
- Ditto 18th March
1834, No. 51.
- No. 162. a. Letter from Superintendent of Canals, dated 16th January 1834, to Superintending Engineer, Lower Provinces, in reply to Secretary to Military Board's Letter of the 3rd December 1833, reports his having commenced digging out the Circular Canal to an uniform depth and width, and his having adopted measures for securing the Banks of the Canal near the Locks, and remarks on the value of rubble stone as the most certain and readiest means of protecting the banks and bottom of Water-courses, and suggests the expediency of having a large stock on hand ; also states, he will submit an Estimate of the expense of making the Section of the Balliaghat Canal equal to that of the Circular Canal, when his experience in digging out the latter will furnish him with correct data. . . .
- Ditto ditto, ditto.
- No. 163. Letter from Secretary to Military Board, dated 18th March 1834, to Superintending Engineer, Lower Provinces, stating, that the Superintendent of Canals should advertize in the Exchange Gazette, that he will land stone Ballast at his own
- Ditto ditto, ditto.

expense, and in the mean time furnish an Estimate of the expense of piling and procuring rubble stones from the vicinity of Rajmahal.

Military Board's
Proceedings, 21st
March 1834, No.
41.

No. 164. Letter from Superintending Engineer, L. P., dated 22nd February 1834, to Secretary to Military Board, transmits, with reference to the Board's Letter No. 4,393, of the 28th January 1834, the Paper marked No. 164. a.

Ditto ditto, ditto. No. 164. a. Letter from Superintendent of Canals, dated 12th February 1834, to Superintending Engineer, L. P., transmitting Plan and Estimate for constructing a Cess Pool in the Entallee Canal, at the head of the Dhurumtollah Drain, and stating, that the height of the rivetment of the Cess Pool is determined by the highest rise of the water in the Canal, and not by the sill of the Dhurumtollah Drain.

Ditto ditto, No. No. 165. Letter from Secretary to Military Board, dated 21st March 1834, to Superintending Engineer, L. P., stating, that the Board have doubts on that part of the Plan of Cess Pool at the head of the Dhurumtollah Drain by the Superintendent of Canals which proposes to raise the rivetment higher than the sill of the said Drain, the effect of which would be to cause on every occasion of heavy falls of rain, a back water, which would be objected to by the Calcutta Magistrates in the Conservancy Department, and requesting that the Board's remarks may be submitted to the Superintendent of Canals for his observations on the same.

Ditto, 6th May
1834, No. 43.

No. 166. Letter from Superintending Engineer, L. P., dated 19th April 1834, to Secretary to Military Board, transmits with reference to Board's Letter, No. 3,480, of 3rd December last, the Paper marked No. 166. a.

Ditto ditto, ditto. No. 166. a. Letter from Superintendent of Canals, dated 17th March 1834, to Superintending Engineer, L. P., transmitting an Estimate for digging out the Balleaghatta Canal, and stating, that the Canal would have to be closed 72 days; at the same time expressing his opinion, that the work is not necessary, unless it is found that the water admitted from the Hooghly River is not capable of deepening and widening the Canal. ..

Ditto ditto, No. No. 167. Letter from Secretary to Military Board, dated 6th May 1834, to Superintending Engineer, L. P., stating, that the Board cannot sanction the Superintendent of Canal's Estimate for excavating the Balliaghat Canal, until they know what effect his trial of scouring the Canals produces.

Ditto ditto, No. 26. No. 168. Letter from G. A. Prinsep, Esq., dated 18th April 1834, to Secretary to Military Board, submitting a formal complaint of the

serious injury done to the Salt Works at Balliaghat, which he is carrying on under a contract with the Government, by an act of the Superintendent of Canals, in admitting the River Water through the Chitpore Lock Gates.

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| <p>No. 169. Letter from Superintendent of Canals, dated 19th April 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 15th instant, No. 5,799, reports that the Chitpore Lock Gates were opened on the 1st instant, to admit a current of water to scour the Circular Canal, and free it of the filth and stagnant brackish water in it.</p> | <p>Military Board's
Proceedings, 6th
May 1834, No. 37.</p> |
| <p>No. 170. Letter from Secretary to Military Board, dated 22nd April 1834, to Superintendent of Canals, transmitting the Paper marked No. 168, and requesting his remarks thereon.</p> | <p>Ditto ditto, No. 37.</p> |
| <p>No. 171. Letter from Superintendent of Canals, dated 25th April 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 22nd instant (marked No. 170,) transmits his observations on Mr. Prinsep's formal complaint.</p> | <p>Ditto ditto, No. 39.</p> |
| <p>No. 172. Letter from Secretary to Military Board, dated 6th May 1834, to Superintendent of Canals, stating that the restrictions as to lashing back the Chitpore Lock Gates are for the present withdrawn.</p> | <p>Ditto ditto, No. 37.</p> |
| <p>No. 173. Letter from Military Board, dated 6th May 1834, to the Honorable V. P. in Council, transmitting the Papers marked No. 168. and No. 171, and stating, that they are of opinion that Mr. Prinsep has no special cause for complaint.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 174. Letter from Secretary to Military Board, dated 6th May 1834, to G. Prinsep, Esq. stating in reply to his Letter of the 18th ultimo, (marked No. 168.) that the subject of his complaint has been submitted for the orders of Government, and in the interim the Superintendent of Canals has been directed to use his own discretion in opening and shutting the Chitpore Lock Gates.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 175. Letter from Superintending Engineer Lower Provinces, dated 11th March 1834, to Officiating Secretary to Military Board, with reference to the Secretary's Letter of the No. 4,675 of the 14th ultimo, transmits the Paper marked No. 175. a.</p> | <p>Ditto, 13th May
1834, No. 56.</p> |
| <p>No. 175. a. Letter from Superintendent of Canals, dated 4th March 1834, to Superintending Engineer Lower Provinces, transmitting a corrected copy of his Letter of the 9th September 1833, marked No. 175. a.⁽¹⁾ and reporting on the subject of the Drains of the Circular Canal.</p> | <p>Ditto ditto, ditto.</p> |

Military Board's
Proceedings, 13th
May 1834, No. 57.

No. 175. a.⁽¹⁾ Letter from Superintendent of Canals, dated 9th September 1833, to Superintending Engineer Lower Provinces, reporting the repairs done to the Banks of the Circular Canal, and suggesting a Plan of Drains along the Banks of the Canal. ..

Ditto ditto, No.

No. 176. Letter from Secretary to Military Board, dated 13th May 1834, to Superintending Engineer Lower Provinces, stating that the Board are not satisfied with the Superintendent's of Canals Plan of Drains along the Banks of the Circular Canal, and that Mr. Prinsep's Plan appears the most preferable, and if the appertures of his Drains are not large enough they might be made larger.

Ditto 20th May
1834, No. 20.

No. 177. Letter from G. A. Prinsep Esq., dated 17th May 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 6th instant, states, that it is of the greatest importance to the Salt Works that at the close of the season they should be deeply flooded with water of the greatest degree of Saltness procurable, the chief object of those works being the making every season supply brine for the first half of the next, when the Lake has little Salt in it, and hopes the Board will not object to ordering the Lock Gates to be closed for about three weeks, or a fortnight, till the commencement of the Rains, by which he will be enabled to make about 10,000 maunds of Salt. That with respect to the main question he, Mr. P., will address the Board of Customs, Salt and Opium, in order that its effects upon the interest of that Department may be duly brought to the notice of Government.

Ditto ditto, No. 21.

No. 178. Letter from G. A. Prinsep, Esq., dated 19th May 1834, to Secretary to Military Board, stating, that since he, Mr. P., had addressed the Secretary on the 17th instant, he has discovered that the Circular Canal Lock Gates were open on the 16th, 17th and 18th instant, and that the Tide was allowed to pass freely to and fro between the River and the Lake. This happening on the Neaps, did not produce any mischief, and which may not be removed by the Springs, if these are allowed access to the Lake only from the Soonderbunds Nullah; but if the same Plan of opening the Gates continue only two days longer when the Springs commence, the injury to the works will be very great, and requests the Board will allow the Gates to be closed till the 9th proximo.

Ditto ditto, No.

No. 179. Letter from Secretary to Military Board, dated 19th May 1834, to Superintendent of Canals, transmitting in original, Mr. G. A. Prinsep's Letter of the 17th instant, (marked No. 178.) and directing, under the Special circumstances of the case, that the Chitpore Locks Gates may be closed until the commencement of the Rains, or the middle of next month.

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- No. 180. Letter from Secretary to Military Board, dated 19th May 1834, to G. A. Prinsep, Esq., stating, that the Superintendent of Canals has been directed to keep the Chitpore Lock Gates closed, until the middle of next month.
- Military Board's
Proceedings, 20th
May 1834, No.
- No. 181. Letter from Superintendent of Canals, dated 10th May 1834, to Superintending Engineer, L. P., stating, that he has received from Mr. Prinsep, the whole of the Office Books of the Canal Department; and, with reference to his Letter of the 18th March instant, that it appears that information respecting the lands purchased for the Sunderbund Canals is lodged in the Collector's Office.
- Ditto 23rd May
1834, No. 30.
- No. 182. Letter from the Deputy Secretary to Government, dated 19th May 1834, to Military Board, in reply to their Letter of the 6th instant, stating, that the Honorable V. P. in Council approves of the instructions given to the Superintendent of Canals, with reference to the complaint preferred by Mr. G. A. Prinsep of the injury done to his Salt Works on the Salt Water Lake, by keeping open the Chitpore Lock Gate. ..
- Ditto 27th May
1834, No. 17.
- No. 183. Letter from Superintending Engineer, L. P., dated 13th June 1834, to Officiating Secretary to Military Board, transmitting the Papers marked No. 183. a. and No. 184. by which it will be seen, that it was never intended to lead the water from the Bank across the Roadway, and then back again under the Road; and states that the mode adopted by that Officer for Draining the Banks, is the best and simplest that could be followed.
- Ditto, 13th June
1834, No. 43.
- No. 183. a. Letter from Superintendent of Canals, dated 20th May 1834, to Superintending Engineer, L. P., transmitting the Section of the Canal Banks as they are now being formed, which also exhibits the surface Drainage along the side of the Road, and stating, that to have made Mr. Prinsep's Drains sufficiently large to have been cleaned out, would have cost more than two Lacks of Rupees.
- Ditto ditto, ditto.
- No. 184. Letter from Superintendent of Canals, dated 28th May 1834, to Superintending Engineer, L. P., transmitting the Section of the Drains of the Road on the West Bank of the Circular Canal, taken from the measurement of two of them, and remarking on the present state of them.
- Ditto ditto, ditto.
- No. 185. Letter from Superintending Engineer, Lower Provinces, dated 31st May 1834, to Officiating Secretary to Military Board's in reply to his Letter, No. 109. of the 6th instant, transmits the Papers marked No. 185. a. and No. 185. a.⁽¹⁾
- Ditto ditto, No. 44.

Military Board's Proceedings, 13th June 1834, No. 45.	No. 185. <i>a.</i> Letter dated 23rd May 1834, from Committee appointed to report on points connected with the Improvement of the Canal Department, as adverted to in Secretary to Military Board's Letter, No. 2,201, of 10th September last, (marked No. 139.)
Ditto ditto, ditto.	No. 185. <i>a.</i> ⁽¹⁾ Separate Minute, dated 23rd May 1834, by a Member of the Committee, referred to in the Paper marked No. 185. <i>a.</i> dissenting from their views.
Ditto ditto, No.	No. 186. Letter from Officiating Secretary to Military Board, dated 13th June 1834, to Superintending Engineer, Lower Provinces, requesting him to call on the Superintendent of Canals, to submit an Estimate for a Cess Pool to be constructed for an experiment, the place where to be erected, and dimensions to be specified.
Ditto 27th June 1834, No. 49.	No. 187. Letter from Superintending Engineer, L. P., dated 9th June 1834, to Officiating Secretary to Military Board, applying for an advance of Sicca Rupees 6,000, on account of additional Works at the Chitpore Lock.
Ditto, 4th July 1834, No. 26.	No. 188. Letter from Superintending Engineer, L. P., dated 18th June 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 188. <i>a.</i> and No. 188. <i>b.</i>
Ditto ditto, ditto.	No. 188. <i>a.</i> Letter from Superintending Engineer, L. P., dated 31st May 1834, to Superintendent of Canals, stating, that the Military Board declines, in advertence to his Letter of the 17th March instant, to sanction his estimate for digging out the Balliaghaut Canal and sloping its Banks, until they know what effect the experiment of scouring the Canal might produce, and requesting him when that effect is known, to report on that point.
Ditto ditto, ditto.	No. 188. <i>b.</i> Letter from Superintendent of Canals, dated 10th June 1834, to Superintending Engineer, L. P., with reference to the Paper marked No. 188. <i>a.</i> reports on the state of the Balliaghaut Canal, and submits his suggestions for its improvement; and stating that the Current admitted from the Hooghly has had as yet, no material effect in deepening the Canal.
Ditto, 22nd July 1834, No. 7.	No. 189. Letter from Secretary to Government, dated 14th July 1834, to Military Board, transmitting the Papers marked No. 189. <i>a.</i> and No. 189. <i>b.</i> , and requesting that the Superintendent of Canals may be directed to state what objections he may have to offer to the proposition submitted by Mr. George Prinsep.

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No. 189. <i>a.</i> Letter from the Board of Customs, Salt and Opium, dated 5th July 1834, to the Honorable V. P. in Council, transmitting the Paper marked No. 189. <i>a.</i> ⁽¹⁾	Military Board's Proceedings, 22nd July 1834, No. 7.
No. 189. <i>a.</i> ⁽¹⁾ Letter from G. A. Prinsep, Esq., dated 2nd July 1834, to the Officiating Secretary to the Board of Customs, Salt and Opium, replying to the Board's Letter of the 25th ultimo, in which was conveyed a copy of a Letter from Mr. Secretary Prinsep, expressing the wish of Government to be informed in what manner the opening and shutting the Lock Gates at Chitpore might be regulated, so as not to interfere with, and even to benefit the Salt Works at Balliaghaut, upon which subject Mr. P.'s opinion is desired.	Ditto ditto, ditto.
No. 190 Letter from Secretary to Military Board, dated 22nd July 1834, to Superintendent of Canals, transmitting a Copy of a Paper marked No. 189. <i>a.</i> ⁽¹⁾ , and requesting him to state any objections he may have to offer to the proposition submitted by Mr. George Prinsep.	Ditto ditto, ditto.
No. 191. Letter, dated 18th July 1834, from Captain Thomson, Superintendent of Canals, to Secretary to Military Board, transmitting the Paper marked No. 191. <i>a.</i> and stating that in measuring the Section's, inaccuracies in the Plans and Reports of the ground belonging to this Canal were detected; the original breadth of ground said to have been purchased for the Canal was 150 feet, whereas on reference to the Field Book of the Survey, it appears to have varied from 155 to 170 feet. ..	Ditto 5th August 1834, No. 51.
No. 191. <i>a.</i> Five Sections of the Balliaghatta Canal.	
No. 191. <i>b.</i> Revised Estimate by the Superintendent of Canals, of the probable expense of excavating the Balliaghatta Canal from the junction of the Circular Canal to the Salt Water Lake to the same Section as the Circular Canal, viz. 72 feet wide at Zero, and 30 feet at bottom, with a depth of 7 feet, and the Banks above water with a slope of 2 to 1, amounting, after correction, to Sicca Rupees 6,850: 14. (See Board's Proceedings, 6th May and 4th July last).	
No. 192. Letter from Superintendent of Canals, dated 23rd July 1834, to Secretary to Military Board, stating, that he omitted in his Letter of the 18th instant to mention, that no injury would accrue to private property by the alteration suggested to the Banks of the Balliaghatta Canal.	Ditto ditto, No. 52.
No. 193. Letter from Secretary to Military Board, dated 5th August 1834, to Superintendent of Canals, stating, that as the shutting up the Entally and Circular Canals for so long a period	Ditto ditto, No.

as $2\frac{1}{2}$ or 3 months would have the effect of destroying the confidence of the holders of ground on the sides of the Canal, the Board will postpone the measure referred to in the Paper marked No. 192, till another year.

Military Board's
Proceedings, 15th
August 1834, No.

No. 194. Minute by the Chief Magistrate, regarding the Tolls on the Circular Canal.

Ditto ditto, ditto.

No. 195. Letter from Secretary to Military Board, dated 25th July 1834, to the Secretary of the Revenue Board, stating, that a considerable quantity of fire-wood is brought from Bhowanypore, on the Banks of Tolly's Nullah, to Narkuldangah, on the Circular Canal, by land, and requesting them to take into their consideration, how far this singular result may be attributable to the existence of a double place of receipt of Toll on the Circular Canal.

Ditto ditto, ditto.

No. 196. Statement of the Collections of Tolls of the New Circular Canal, amounting for the year 1831, to Rs. 106:4:3;—for 1832, Rs. 1,027:0:8;—for 1833, Rs. 1,213:12:3;—for 1834, from January to June, Rs. 352:13:9.

Ditto ditto, ditto.

No. 197. Letter from Secretary to Military Board, dated 27th July 1834, to Captain J. Thomson, informing him that Sumboonauth Ghosaul is the farmer of the fishery of the Circular Canal, at an annual rent of Rs. 271.

Ditto ditto, No 50.

No. 198. Letter from Superintendent of Canals, dated 26th July 1834, to Officiating Secretary to Military Board, states, with reference to the Paper marked No. 189. a.⁽¹⁾, the objections that exist against Mr. G. Prinsep's propositions regarding the management of the Circular Canal Lock Gates.

Ditto ditto, ditto

No. 199. Letter from Secretary to Military Board, dated 15th August 1834, No. 1,904, to Superintendent of Canals, in reply to his Letter marked No. 198., requests him to furnish a specific detail of the plan of operation he would propose to adopt as essential to the complete economical management of the Canal, stating the time he would propose to admit a current, and the strength of it, and the period when the Lock Gates might be lashed back.

Ditto, 22nd August
1834, No. 37.

No. 200. Letter from Superintendent of Canals, dated 26th June 1834, to Superintending Engineer, L. P., stating his reasons for not submitting an Estimate for a Cess Pool until the level of the bottom of the Drain, at the mouth of which it is to be formed, is finally determined upon.

Ditto ditto, No.

No. 201. Letter from Secretary to Military Board, dated 5th August 1834, to Superintendent of Canals, with reference to the Paper

marked No. 200. requests explanation respecting the high and low water levels in the Circular Canal being fixed and known ; and stating that the alteration of the levels of the mouths of the Drains cannot be calculated on, as it would be more advisable they should be lowered than raised.

- No. 202. Letter from Superintendent of Canals, dated 9th August 1834, to Secretary to Military Board, stating, that he cannot at present state, what the high and low water levels in the Circular Canal will be on any day of the year ; that as the levels of the mouths of the Drains running into the Circular Canal are not to be altered, the proposition of having Cess Pools is of course impracticable ; and the propositions of the Committee, of which Col. Wood, Engineers, was President, are the only resources now left for the removal of the filth brought into the Canal.

Military Board's
Proceedings, 22nd
August 1834, No.
40.

- No. 203. Letter from Superintendent of Canals, dated 7th August 1834, to Secretary to Military Board, proposing as a saving of expense, and preventing the necessity of closing the Canal, to deepen the Balliaghatta Canal by Steam Dredgers ; and requesting authority being granted him to regulate the Boats in the Canals ; that the experience of the past year has shewn, that the Magistrate of the 24-Pergunnahs has not the power either to preserve the Navigation open, prevent injury to the Banks, or guard against the daily wreck of Boats.

Ditto, 26th August
1834, No. 30.

- No. 204. Letter from Secretary to Military Board, dated 26th August 1834, to Superintendent of Canals, approving the use of the Dredging Boat as proposed, and requesting him to state in what manner he wishes to exercise the authority to regulate the Boats in the Canals.

Ditto ditto, No.

- No. 205. Letter from Secretary to Military Board, dated 3rd May 1833, to Superintending Engineer, L. P., directing his attention to the annual report on Canal operations during 1831 and 1832, and stating that the duties that now devolve on the Superintendent of Canals is to maintain the Canals in a state of efficiency, and to recommend every measure which science or ingenuity may suggest of rendering the Canals as extensively useful to the Public and productive to Government as possible ; and that the Superintendent be requested to report on the several suggestions by Mr. Prinsep, relative to encroachments on Government Lands, &c.

Ditto 9th September
1834, No.

- No. 206. Letter from Superintendent of Canals, dated 2nd of August 1834, to Secretary to Military Board, with reference to Board's Letter of the 3rd May 1833, (marked No. 205.) on the subject of the efficient protection of the Government Lands on the Banks of the Circular Canal from encroachments, and also of

Ditto ditto, No. 22.

Mr. Prinsep's proposal of Registering the lots, suggests that the proposed Registry be kept on the American Plan. . . .

Military Board's
Proceedings, 9th
Sept. 1834, No. 22.

No. 207. Letter from Secretary to Military Board, dated 9th September 1834, to Superintendent of Canals, stating that there are already Plan and Register of the Lands along the Circular Canal with the Chief Magistrate, which supersede the necessity of any other Register or Plan. . . .

Ditto, 12th Sept.
1834, No. 12.

No. 208. Letter from Superintendent of Canals, dated 4th September 1834, to Secretary to Military Board, stating, with reference to the Board's Letter of the 26th of August last (marked No. 204.) the nature of the authority required by him to regulate the Boats in the Balliaghatah Canal. . . .

Ditto ditto, ditto.

No. 209. Letter from Secretary to Military Board, dated 12th September 1834, to Superintendent of Canals, stating, that nothing effectual can be done regarding the regulation of Boats in the Balliaghaut Canal without the formation of a Basin, as already proposed, and in the meantime refers him to the Magistrate and Collector of the 24-Pergunnahs, for such authority as may be in their power to grant. . . .

Ditto, 23rd Sept.
1834, No. 61.

No. 210. Letter from Superintendent of Canals, dated 15th September 1834, to Secretary to Military Board, stating, with reference to his Bill No. 5, that the mud dug out of the Circular Canal was equal to the average quantity deposited in two years; that the Canal can be dug out every second year for Rs. 4,700, independently of the expense and inconvenience of closing the Circular Canal. . . .

Ditto ditto, No.

No. 211. Letter from Military Board, dated 23rd September 1834, to the Honorable V. P. in Council, transmitting with remarks, the Bill of the Superintendent of Canals for excavating the bed of the Circular Canal, which has exceeded the Estimate by Rs. 2,950.

Ditto, 26th Sept.
1834, No. 29.

No. 212. Letter from Superintending Engineer, L. P., dated 17th May 1834, to Secretary to Military Board, transmitting the Paper marked No. 212. a. . . .

Ditto ditto, No. 30.

No. 212. a. Letter from J. Prinsep, Esq., dated 15th March 1834, to Superintending Engineer, L. P., reporting on the Canal operations of 1832-33, and transmitting Bills and other Documents connected therewith, and apologizing for having so long delayed reporting the final transfer of his duties to his successor. . . .

Ditto ditto, No. 32.

No. 213. Letter from Superintending Engineer, L. P., dated 26th September 1834, to Secretary to Military Board, transmitting Mr. Prinsep's Plan of the Lock Gates at Chitpore. . . .

	PAGE.
No. 214. Letter from Superintending Engineer, L. P., dated 11th June 1834, to Secretary to Military Board, transmitting the Paper marked No. 214. a. 	Military Board's Proceedings, 26th September 1834, No. 33.
No. 214. a. Report on the Circular Canal Excavation and the Lock Gates at Chitpore, by the Committee of Survey. 	Ditto ditto, ditto.
No. 215. Letter from Superintending Engineer, Lower Provinces, dated 31st May 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 215. a., and stating, that he has requested the Superintendent of Canals to furnish an Estimate of the Apparatus adverted to, for working the Lock Dams at the Chitpore Locks. 	Ditto, 7th October 1834, No. 31.
No. 215. a. Report from Superintendent of Canals, dated 10th May 1834, to Superintending Engineer, Lower Provinces, on the present state of the Canal Works, and means of improving them. ..	Ditto ditto, ditto.
No. 216. Letter from the Collector of Calcutta, dated 11th August 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 216. a. 	Ditto ditto, No. 32.
No. 216. a. Statement exhibiting the Receipt of the amount of Tolls at the Chowkee on the New Circular and Entallee Canals. ..	Ditto ditto, No.
No. 217. Letter from Officiating Secretary to Military Board, dated 28th August 1834, to Superintendent of Canals, requesting to be furnished with the number of Boats that have been passed through the Lock Gates monthly, since the date of its being last opened. 	Ditto ditto, ditto.
No. 218. Letter from Superintendent of Canals, dated 29th August 1834, to Officiating Secretary to Military Board, transmitting the Paper marked No. 218. a. 	Ditto ditto, No. 33.
No. 218. a. Table, shewing the number of Boats that have passed through the Chitpore Locks, from 19th March to 28th August 1834, inclusive. 	Ditto ditto, ditto.
No. 219. Letter from the Military Board, dated 12th September 1834, to the Vice President in Council, transmitting with the opinions of the Board thereon, the Papers marked No. 215. and No. 215. a. 	Ditto ditto, No. 34.
No. 220. Letter from Secretary to Government, dated 29th September 1834, to Military Board, in reply to their Letter of the 12th September instant, sanctions the Disbursement of a sum not exceeding Ra. 1,500 for the purpose of removing sunken Boats from the Canals, and repairing and improving the length of	Ditto ditto, No. 35.

the Tow-paths, and stating, that the general question discussed in Colonel Galloway's Minutes will be reserved for future consideration.

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| Military Board's Proceedings, 7th October 1834. | No. 221. Letter from Officiating Secretary to Military Board, No. 2871, dated 7th October 1834, to Superintending Engineer, Lower Provinces, transmitting an Extract (Paragraph 2nd) of the Paper marked No. 220. |
| Ditto, 28th October 1834, No. 2. | No. 222. Letter from Secretary to Government, dated 13th October 1834, to Military Board, stating that the Bill of the Superintendent of Canals referred to in the Paper marked No. 211, has been passed. |
| Ditto, 4th November 1834, No. 2. | No. 223. Letter from Secretary to Government, dated 20th of October 1834, to Military Board, stating that the Bills, referred to in the Paper marked No. 212. a. has been passed. |
| Ditto, 19th December 1834, No. 37. | No. 224. Letter from Superintendent of Canals, dated 19th November 1834, to Superintending Engineer, replying to his Letter of the 10th May last, relative to forming Embankments and Tow-paths on the Lake Channel. |
| Ditto ditto, ditto. | No. 225. Letter from Secretary to Military Board, dated 19th December 1834, to Superintendent of Canals, requesting him to furnish a detailed Estimate for forming the Tow-paths, &c. referred to in the Paper marked No. 224. |
| Ditto, 6th January 1835, No. 49. | No. 226. Letter from Superintendent of Canals, dated 8th November 1834, to the Superintending Engineer, L. P. reporting that 200 yards of the South Bank of Entallee Canal West of the Coolya Bridge, as might have been anticipated, has slid into the Canal, and stating that measures for the prevention of which have not yet been authorized. |
| Ditto ditto, ditto. | No. 227. Letter from Superintendent of Canals, dated 19th November 1834, to the Superintending Engineer, L. P., stating that the measures for preventing the sliding of the Banks of the Entallee Canal are, increasing the Slope of the Bank to 2 of base to 1 in height, and regulating the manner of fastening the Boats in the Canal, but that to remedy the injury caused by the sliding of the Bank would be inexpedient, as the expense would far exceed the benefit likely to result therefrom. |
| Ditto ditto, No. 45. | No. 228. Letter from Superintendent of Canals, dated 30th October 1834, to the Superintending Engineer, L. P., stating that at the conclusion of the rains the sediment brought into the Circular Canal this season is more than twice as much as the yearly average; that the quantity deposited by the Narcoledangah Drain alone is 2,13,000 cubic feet, and by the other Drains in |

proportion ; that the least depth of water at Narcoledangah is 1 feet 8 inches, Manicktullah 2 feet 6 inches, and Nunddunbaugan Drain 2 feet 2 inches ; that the height of the River Hoogly is at present 7 feet above the average level ; and that he cannot expect to be able to open the Chitpore Lock Gates before the end of November, when by this latter means he expects to succeed in deepening the Canal about 2 feet ; but as the Salt Water Lake falls a foot below Zero in the cold season, there would remain only 2 feet 6 inches of water in the Canal, which will prevent heavy loaded Boats from passing through it.

- No. 229. Letter from Secretary to Military Board, dated 25th November 1834, to the Superintending Engineer, L. P., requesting him to call upon the Superintendent of Canals to explain the data by which he arrives at his conclusion, relative to the quantity of sediment deposited by the Calcutta Drains.

Military Board's
Proceedings, 6th
January 1835, No.
46.

- No. 230. Letter from Superintendent of Canals, dated 28th November 1834, to Superintending Engineer, L. P., stating that the annual average quantity of sediment from each of the Calcutta Drains is about 90,000 cubic feet, ascertained by the quantity dug out of the Entallee Canal, and what was dredged and dug out of the Circular Canal ; that Colonel Wood's Committee on Mr. James Prinsep's information, assumed the above quantity, and reported it to the Military Board with their reasons for their opinion ; that he, the Superintendent's experience, has not induced him to make any alteration on this assumed fact ; and stating the manner the quantity of sediment deposited by the Narcoledangah Drain, and the quantity of rain that fell on the 1st of June to 31st of October, have been ascertained. .

Ditto ditto, No. 47.

- No. 231. Letter from Superintending Engineer, L. P., dated 9th December 1834, to the Officiating Secretary to Military Board, transmitting a sketch by the Superintendent of Canals, of the effect the Nacoledangah Drain has on the depth of the Circular Canal, shewing also that the effect of opening the Lock Gates has increased the depth at the Narcoledangah Bridge 2 feet, as was anticipated.

Ditto ditto, No. 48.

- No. 232. Letter from Military Board, dated 6th January 1835, to the Governor General of India in Council, in continuation of their Letter No. 2662, of the 23rd September last, transmits the Paper marked No. 228. and No. 231. with observations thereon.

Ditto ditto, No.

- No. 233. Letter from Superintendent of Canals, dated 8th November 1834, to Superintending Engineer, L. P., relative to the repairs of the Dredging Boat and constructing of Mud Boats. ..

Ditto, 9th January
1835, No. 46.

Military Board's Proceedings, 23rd January 1835, No. 71.	No. 234. Letter from Superintendent of Canals, dated 8th November 1834, to Superintending Engineer, L. P., reporting on the state of the Pucka Road on the Western Bank of the Circular Canal.
Ditto ditto, No.	No. 235. Letter from Superintending Engineer, L. P., dated 9th December 1834, to Officiating Secretary to Military Board, transmitting an Estimate amounting to Sicca Rupees 3,004 : 1 : 11, by the Superintendent of Canals, for repairing the Pucka Road on the Western Bank of the Circular Canal.
Ditto ditto, No.	No. 236. Letter from Military Board, dated 23rd January 1835, to Governor General in Council, transmitting the Paper marked No. 234. and the Estimate referred to in the Paper marked No. 235. and stating, that in the opinion of the Board a Toll might be levied on the Road above referred to.
Ditto, 3rd February 1835, No. 30.	No. 237. Letter from Superintendent of Canals, dated 20th August 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 15th August 1834, No. 1904. transmits the Paper marked No. 237. a., and states the Plan of Operations he would recommend for carrying into effect, with economy and regard to private interests, the objects referred to by the Board relative to the Circular Canal.
Ditto ditto, No.	No. 237. a. Table of Tides in the River Hooghly, by the Superintendent of Canals.
Ditto ditto, No.	No. 238. Letter from Superintendent of Canals, dated 5th September 1834, to Secretary to Military Board, remarking on the effects of the Tides on the water in the Circular Canal.
Ditto ditto, No.	No. 239. Letter from Officiating Secretary to Military Board, dated 9th September 1834, to G. A. Prinsep, Esq., transmitting the Paper marked No. 237. and requesting his opinion on the same.
Ditto ditto, No. 31.	No. 240. Letter from G. A. Prinsep, Esq., dated 16th September 1834, to Officiating Secretary to Military Board, in reply to his Letter of the 9th instant, offers his opinion on the management of the Chitpore Lock Gates with reference to his Salt Works at Balliaghatta.
Ditto ditto, No.	No. 241. Letter from Secretary to Military Board, dated 3rd October 1834, to Superintending Engineer, L. P., transmitting the Papers marked No. 237. and No. 240. and requesting his observations on the same.
Ditto ditto, No. 32.	No. 242. Letter from Superintending Engineer, L. P., dated 20th October 1834, to Officiating Secretary to Military Board, in reply to

his Letter of the 3rd instant marked No. 241. states, that the measures proposed by the Superintendent of Canals appear to be well adapted for attaining the objects desired, and that Mr. Prinsep has no just grounds for complaint of injury being done to his Salt Works.

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| <p>No. 243. Letter from Military Board, dated 11th November 1834, to the Vice-President in Council, with reference to the Letter of the Secretary to Government of 14th July last, marked No. 189, transmits the Papers marked No. 198. No. 199. No. 237. No. 237. a. No. 240. and No. 242.</p> | <p>Military Board's
Proceedings, 3rd
February 1835,
No. 33.</p> |
| <p>No. 244. Letter from Secretary to Government, dated 12th January 1835, to Military Board, replying to their Letter of the 11th November 1834, marked No. 243, on the management of the Chitpore Locks, with reference to the injury likely to be done to the experimental Salt Works at Balliaghatta.</p> | <p>Ditto ditto, No. 34</p> |
| <p>No. 245. Petition of Parbutty Daby, requesting to hire several parcels of Land on the Banks of the New Eastern Canal, for the purpose of Cultivation.</p> | <p>Ditto, 10th Fe-
bruary 1835, No.
70.</p> |
| <p>No. 246. Letter from Secretary to Military Board, dated 20th January 1835, to Superintendent of Canals, transmitting the Paper marked No. 245.</p> | <p>Ditto ditto, No.</p> |
| <p>No. 247. Letter from Superintendent of Canals, dated 23rd January 1835, to Secretary to Military Board, stating, that it would be an advantage to let out the lands on the Banks of the Sundurbun Canals, for the purposes of Cultivation and erecting Bazars. ..</p> | <p>Ditto ditto, No. 71.</p> |
| <p>No. 248. Letter from Officiating Secretary to Military Board, dated 31st January 1835, No. 4962, to Superintendent of Canals, transmitting extract of the Paper marked No. 244.</p> | <p>Ditto ditto, No. 75.</p> |
| <p>No. 249. Letter from Secretary to Military Board, dated 10th February 1835, to Superintendent of Canals, replying to his Letter marked No. 247.</p> | <p>Ditto ditto, No. 72.</p> |
| <p>No. 250. Letter from Superintendent of Canals, dated 23rd December 1834, to the Superintending Engineer, L. P., requesting instructions relative to the Cutting the Jungle between the Embankment of Land and the Navigable Channels in the Soondurbuns, and complaining of the Embankments of the Soondurbun Canals having been Cut through to allow the water to run off the adjacent land, and to catch fish. ...</p> | <p>Ditto, 24th Fe-
bruary 1835, No.
57.</p> |
| <p>No. 251. Letter from Secretary to Military Board, dated 24th February 1835, to Superintending Engineer, L. P., requesting him to</p> | <p>Ditto ditto, ditto.</p> |

call on the Superintendent of Canals, for an Estimate of the probable cost of Cutting the Jungle referred to in his Letter, (marked No. 250,) and stating that the Superintendent of Canals makes no mention of a sum of Rs. 1,500 having already been sanctioned by Government for Cutting Jungle, &c., as communicated in the Board's Letter. No. 2871, of the 7th October 1834, marked No. 221.

Military Board's
Proceedings, 3rd
March 1835, No.
19.

No. 252. Letter from Superintendent of Canals, dated 2nd February 1835, to Officiating Secretary to Military Board, with reference to his Letter of the 31st ultimo. (marked No. 248.) states, that he knows of no method of preventing the Canals silting up, except by keeping the Lock Gates at Chitpore open at all times that may be practicable, and which is necessary for the preservation of the health of those residing near a stagnant Canal; and stating that a convenient mode of improving Mr. Prinsep's Salt Works at Balliaghatta, would be, by making a Cut connecting the brine fields with the Byah Nullah, and cutting off all connection with the Canal.

Ditto ditto, No. 42. No. 253. Letter from Superintendent of Canals, dated 27th February 1835, to Secretary to Military Board, in reply to his Letter of the 10th instant, marked No. 249. states, that the ground on the Banks of the Soonderbund Canals which is available for being rented was covered, with the earth which was excavated from the Canal; that his being able to collect the rents at an expense not exceeding the amount of them, will depend on the authority granted him for that purpose.

Ditto ditto, No. No. 251. Letter from Secretary to Military Board, dated 3rd March 1835, to Superintendent of Canals, authorizing him to rent the ground on the Banks of the Soondurbun Canals in lots, according to his discretion.

Ditto ditto, No. No. 254 $\frac{1}{2}$. Letter from Military Board, dated 3rd March 1835, No. 5539, to the Governor General of India in Council, transmitting, with observations, the Papers marked No. 254 $\frac{1}{2}$, a. and No. 254 $\frac{1}{2}$, b.

Ditto ditto, No. No. 254 $\frac{1}{2}$, a. Estimate by the Superintendent of Canals, of the probable expense of making Tow-paths on the Salt Water Lake, amounting to Co's. Rs. 3,275.

Ditto ditto, No. No. 254 $\frac{1}{2}$, b. Estimate by the Superintendent of Canals, of the probable expense of excavating the Balliaghatta Canal from the junction of the Circular Canal to the Salt Water Lake to the same section as the Circular Canal; viz. 72 feet wide at Zero, 30 feet deep, and reducing the height of the Banks, and making them to a slope of 2 to 1, amounting to Co's. Rs. 5,000.

	PAGE.
No. 255. Letter from Superintendent of Canals, dated 20th December 1834, to the Superintending Engineer, L. P., transmitting two Estimates ; viz. one for digging out the Entallee Canal Westward from Coolya Bridge, amounting to Rs. 3281 : 11 : 0 and the other for clearing out the Cess Pool of the Dhurumtollah Drain, amounting to Rs. 547 : 8 : 0 : and stating that Boats cannot approach the Cess Pool to take away its contents owing to the shallowness of the Canal.	Military Board's Proceedings, 10th March 1835, No. 75.
No. 256. Letter from Secretary to Military Board, dated 24th February 1835, to Superintendent of Canals, requesting to be informed if a partial removal of the obstructions in the Entallee Canal, which at present prevent Boats from approaching the Cess Pool, might not be made, instead of incurring the heavy expense proposed by the Superintendent.	Ditto ditto, No. 76.
No. 257. Letter from Superintendent of Canals, dated 27th February 1835, to the Secretary to Military Board, in reply to his Letter marked No. 256. states, that the partial removal of the obstructions at the head of the Entallee Canal, cannot be effected at a moderate expense	Ditto ditto, No. 77.
No. 258. Letter from Military Board, dated 10th March, 1835, to the Governor General of India in Council, transmitting the Papers marked No. 255. and No. 257. and recommending that the Estimates referred to in the former Paper, be sanctioned. . .	Ditto ditto, No.
No. 259. Letter from Superintendent of Canals, dated 19th February 1835, to Secretary to Military Board, requesting permission to make 4 or 5 Lacks of Bricks, for repairing the Road on the bank of the Circular Canal, and recommending that the Road be paved with Bricks instead of Khoah as being cheaper, smoother, and more easily repaired.	Ditto, 13th March 1835, No. 15.
No. 260. Letter from Secretary to Military Board, dated 13th March 1835, to Superintendent of Canals, authorizing him to make the Bricks referred to in his Letter, marked No. 259.	Ditto ditto, No. 16.
No. 261. Letter from Secretary to Government, dated 24th March 1835, to Military Board, stating, that the Estimate for clearing out the Dhurumtollah Cess Pool is sanctioned ; that in respect to the Estimate for clearing out the Canal, further information is required ; and requesting an Estimate of the expense of the partial clearing the Canal may be furnished.	Ditto, 27th March 1835, No. 11.
No. 262. Letter from Superintendent of Canals, dated 2nd March 1835, to Secretary to Military Board, transmitting a Plan and Estimate for an improved mode of working the Paddle Sluices of the Chitpore Locks.	Ditto, 7th April 1835, No. 42.

Military Board's Proceedings, 7th April 1835, No. 12.	No. 263. Letter from Military Board, dated 7th April 1835, to Governor General of India in Council, transmitting the Paper marked No. 262. and recommending that the Estimate therein referred to. be sanctioned.
Ditto, 10th April 1835, No. 10.	No. 264. Letter from Secretary to Government, dated 28th March 1835, to Military Board, transmitting the Paper marked No. 264. <i>a</i> .
Ditto ditto, No.	No. 264. <i>a</i> . Letter in Original, from the Secretary to the Sudder Board of Revenue, dated 13th March 1835, on the subject of the shallowness of Tolley's Nullah, and the employment of the Dredging Steam Engine to deepen the Channel.
Ditto ditto, No. 5.	No. 265. Letter from Secretary to Government, dated 4th April 1835, to Military Board, stating, that the Bill of the Superintendent of Canals, amounting after correction, to Rs. 3,027 : 6 : 7, for making 8 Windlasses, and completing and repairing the Lock Gates at Chitpore, has been passed.
Ditto ditto, No. 20.	No. 266. Letter from G. A. Prinsep, Esq. dated 8th April 1835, to Secretary to Military Board, transmitting the Paper marked No. 266. <i>a</i> . and stating that if the Superintendent of Canals carries his intention referred to in his Letter, into effect, it will be attended with very serious injury to the Balliaghaut Salt Works, and begging that the Superintendent be directed to defer the opening the Lock Gates till some time after the second week in June, should he then require the free current of the River for any purpose essential to the interests of the Canal...
Ditto ditto, No.	No. 266. <i>a</i> . Letter from Superintendent of Canals, dated ---- to G. A. Prinsep Esq. apprising him of his, the Superintendent's, intention of opening the Chitpore Lock Gates.
Ditto ditto, No. 11.	No. 267. Letter from Military Board, dated 10th April 1835, to Superintendent of Canals, transmitting a copy of the Paper marked No. 264. <i>a</i> . and requesting his sentiments thereon.
Ditto ditto, No. 21.	No. 268. Letter from Secretary to Military Board, dated 10th April 1835, to Superintendent of Canals, stating, that it appears that he has not attended to the orders of Government, communicated in the Secretary's Letter, No. 4962, of the 31st January last, (marked No. 248.) which requires that due notice be given to Mr. Prinsep of any intention of opening the Chitpore Lock Gates; the notice of one day given by the Superintendent is not considered by the Board as sufficient, and they request, that he may keep the Lock Gates closed, and re-open them a week hence, should he not in the interim receive further instructions; and requesting him to explain, why it is necessary to keep the Locks open for six weeks?

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No. 269. Letter from Secretary to Military Board, dated 10th April 1835, to G. A. Prinsep, Esq., in reply to his Letter, marked No. 266. transmits a Copy of the Paper, marked No. 268.	Military Board's Proceedings, 10th April 1835, No.
No. 270. Letter from Superintendent of Canals, dated 4th April 1835, to Secretary to Military Board, in reply to his Letter, No. 6194, of the 27th March last, states, that the Dhurumtullah Cess Pool cannot be dug out until December next, and points out the necessity of digging out the Entallee Canal.	Ditto, 28th April 1835, No. 48.
No. 271. Letter from Secretary to Military Board, dated 14th April 1835, to Superintendent of Canals, with reference to his Letter of the 29th August 1834, (marked No. 218.) requests him to furnish a Statement of the number of Boats passed through the Chitpore Locks, from the 28th August 1834 to 1st of April 1835.	Ditto ditto, No.
No. 272. Letter from Secretary to Military Board, dated 14th April 1835, to the Collector of Calcutta, with reference to his Letter of the 11th August 1834, (marked No. 216.) requests him to furnish a Statement of the receipts of Tolls at the Chowkees on the Circular and Entallee Canals, from the 1st July 1834 to 1st April 1835.	Ditto ditto, No.
No. 273. Letter from the Military Board, dated 28th April 1835, to the Governor of Bengal, with reference to the Paper marked No. 267, transmits the Paper marked No. 270, with observations thereon.	Ditto ditto, No.
No. 274. Letter from Superintendent of Canals, dated 18th April 1835, to Secretary to Military Board, in reply to his Letter of the 10th instant, No. 6,428, reports on the Dredging out the Sandbank in Tolley's Nullah, at the mouth of the Kamapookerya Nullah, and on the Nullah generally.	Ditto 1st May 1835, No. 17.
No. 275. Letter from Secretary to Military Board, dated 1st May 1835, No. 6614, to Superintending Engineer, L. P., transmitting the Papers marked No. 274, and requesting his opinion on the subject of employing the Steam Dredger to deepen Tolley's Nullah.	Ditto ditto, No. 18.
No. 276. Letter from Military Board, dated 1st May 1835, to Secretary to Sudder Board of Revenue, in reply to his Letter of the 13th March last, (marked No. 264. a.) to the address of Mr. Secretary Macnaghten, states, that by the inquiries they have made on the subject of the above letter, they are of opinion that the Dredging Machine is neither the best, nor cheapest means of removing the obstruction that exists in Tolley's Nullah.	Ditto ditto, No. 20.

- Military Board's
Proceedings, 1st
May 1835, No. No. 277. Letter from Military Board, dated 1st May 1835, to the Go-
vernor of Bengal, in reply to Mr. Secretary Mangles' Letter,
No. 448 of the 28th March, on the subject of removing a
Sand-bank from Tolley's Nullah.
- Ditto, 12th May
1835, No. 53. No. 278. Letter from Superintendent of Canals, dated 23rd April 1835,
to Superintending Engineer, L. P., stating his right or other-
wise to Cut the Jungle on the Banks of the Soonderbund
Canals, to permit tracking along them, &c.
- Ditto ditto, No. 5. No. 279. Letter from Secretary to Government, dated 5th May 1835, to
Military Board, in reply to their Letter of the 28th ultimo,
states, that the Honorable the Governor of Bengal approves of
their proposition to suspend the clearing out the Cess Pool
sanctioned on the 24th March last, and of excavating the In-
tallee Canal, and requests that the Estimate for Rs. 547 : 8 : 0,
sanctioned on the above date, may be cancelled.
- Ditto 19th May
1835, No. No. 280. Letter from Military Board, dated 19th May 1835, to the
Governor of Bengal, with reference to the 5th Paragraph of
their Letter of the 10th September 1833, marked No. 138,
transmits a Bill by the Superintendent of Canals for expense
incurred in making Tow-paths to the Soondurbun Canals,
amounting to Sa. Rs. 813 : 7 : 8.
- Ditto, 16th June
1835, No. 28. No. 281. Petition by Dhooman Khan, dated 26th May 1835, begging that
he may be allowed to rent the Government Lands along the
Banks of the Mofussil Canals between Baminghatta and Chil-
latullah.
- Ditto ditto, No. No. 282. Letter from Secretary to Military Board, dated 6th June 1835,
to Superintending Engineer, L. P., transmitting the Paper
marked No. 281, and requesting him to direct the Superinten-
dent of Canals to enter into such arrangement with the Peti-
tioner, Dhooman Khan, as may appear to him most fit. ..
- Ditto ditto, No. 30. No. 283. Letter from Superintendent of Canals, dated 10th June 1835,
to Superintending Engineer, L. P., stating, that there are
no Government Lands on the Banks of the Soondurbun
Canals that could be rented ; that Dhooman Khan must be
aware that he has no Grounds for his Petition ; and that he,
the Superintendent, suspects that Dhooman Khan has taken
possession of Grounds belonging to Zemindars, stating, that
it pertains to Government, and that he occupies it by per-
mission.
- Ditto ditto, No. 31. No. 284. Letter from Secretary to Military Board, dated 16th June 1835,
to Superintending Engineer, L. P., transmitting an extract of
a Letter No. 157, of the 27th February last, marked No. 253,

from Captain Thomson, and requesting him to call on that Officer to state any objections that he considers to exist to renting the Lands on the banks of the Canals adverted to. . .

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| <p>No. 285. Letter from Superintendent of Canals, dated the 23rd June 1835, to Superintending Engineer, L. P., stating, that the Ground on the banks of the Soondurbun Canals stated to be available for rent, has subsequently been washed away. . .</p> | <p>Military Board's Proceedings, 30th June 1835, No. 31.</p> |
| <p>No. 286. Letter from Secretary to Sudder Board of Revenue, dated 13th July 1835, to Secretary to Military Board, in reply to Board's Letter of 1st May last, requests to know what would be the expense of removing the impediment in Tolly's Nullah by hand labour and by the Dredging Machine, and if by the former, it be cheaper, whether it is advisable to recommend the sale of the Dredging Vessel.</p> | <p>Ditto, 21st July 1835, No. 18.</p> |
| <p>No. 287. Letter from Secretary to Military Board, dated 21st July 1835, to Secretary to Sudder Board of Revenue, replying to his Letter of the 13th instant, marked No. 286, and transmitting Captain Thomson's Letter of the 18th April, 1835, and Colonel Tickell's Letter of the 28th April, 1835, marked No. 274. and No.</p> | <p>Ditto ditto, No. 19.</p> |
| <p>No. 288. Letter from Superintendent of Canals, dated 1st August 1835, to the Superintending Engineer, L. P., reporting the result of the experiment of admitting a current into the Circular Canal, and working the Dredging Vessel for three weeks in the Balliaghatta Canal, and stating, that the current which was admitted into the Canal in May and June, has almost entirely swept out the sediment from the Circular and Balliaghatta Canals with no injury to the Banks, except in those parts improperly obstructed with Boats.</p> | <p>Ditto, 8th September 1835, No. 50.</p> |
| <p>No. 289. Letter from Superintendent of Canals, dated 6th August 1835, to Superintending Engineer, L. P., stating, that the earth taken up by the Dredger from the Balliaghatta Canal has been thrown on its Banks, so as to continue the Banks to meet those of the Lake Channel ; as when that work is done, he will continue the Embankments along the Lake Channel. . .</p> | <p>Ditto ditto, No. 53.</p> |
| <p>No. 290. Letter from Superintendent of Canals, dated 11th August 1835, to Superintending Engineer, L. P., stating, that as the probable expense of repairs for the maintenance of the Canals will greatly depend on the management of the Lock Gates remaining under his control ; the regulating of Boats in the Canal ; and the prevention of injury to the Banks ; he will, when those points are settled, and he has had experience of their effects, be able to supply the information desired in the</p> | <p>Ditto ditto, No. 52.</p> |

Board's Letter of the 10th instant, in respect to the expense of Dredging and keeping in repair the Canals.

Military Board's
Proceedings, 18th
September 1835,
No. 42.

No. 291. Letter from Secretary to Government, dated 12th May 1835, to Military Board, transmitting the Paper marked No. 291. *a.* and No. 291. *b.*

Ditto ditto, No.

No. 291. *a.* Extract of a Dispatch from the Honorable the Court of Directors, No. 4, dated the 14th May 1834, in the Revenue Department, Paragraphs 6 to 11, stating, that they trust that the New Canal through the Soonderbuns will answer the expectations that have been formed respecting it, and thus render the Navigation of the Jellinghee and Bhagaruttee, a matter of less importance than it has hitherto been.

Ditto ditto, No.

No. 291. *b.* Extract of a Resolution of the Honorable the Governor General of India in Council, in the Revenue Department, passed on the 6th April 1835, directing, with respect to the New Canal through the Soonderbuns, that the Military Board's attention be now called to that subject, in order to ascertain how far the Canal has answered the purposes for which it was executed. ..

Ditto ditto, No.

No. 292. Letter from Secretary to Military Board, dated 31st July 1835, to the Collector of Calcutta, requesting him to state, what is the net amount of Tolls annually collected from Tolley's Nullah during the last five years, and whether an increase of Toll might be expected by improving the Nullah.

Ditto ditto, No. 44.

No. 293. Letter from the Collector of Calcutta, dated 6th August 1835, to the Officiating Secretary to Military Board, transmitting the Paper marked No. 293. *a.*, and stating, that there is no doubt that an increase of Toll would accrue by deepening the Channel of Tolley's Nullah.

Ditto ditto, No.

No. 293. *a.* Statement of the amount of Collections of Tolley's Nullah for the last five years; viz. from 1830-31 to 1834-35.

Ditto ditto, No. 45.

No. 294. Letter from Military Board, dated 18th September 1835, to the Governor of Bengal, reporting, with reference to the Papers marked No. 291. No. 291. *a.* and No. 291. *b.* on the Soonderbun Canals, and referring his Honor to the statement which accompanied their Letter, No. 4,737, of the 20th January last, to the address of the Governor General in Council, which they believe will be found to contain the information now desired respecting the expenditure on embankments from the date of their being placed under the control of the Military Board. ..

Ditto, 23rd October 1835, No. 33.

No. 295. Letter from Superintendent of Canals, dated 17th October 1835, to Superintending Engineer, L. P., reporting, that the

quantity of mud deposited in the Circular Canal at the close of the rains, and previous to opening the Lock Gates, amounts to cubic feet 3,14,000.

- No. 296. Letter from Secretary to Government, dated 31st March 1835, to Military Board, with reference to Board's Letter, No. 2,525, of the 12th September last, (marked No. 219.) requests that they will report the results of their lengthened experience with respect to the degree of benefit derived from the Circular Canal, and the expediency or otherwise of keeping it open with establishments, &c. upon the present footing.
- Military Board's Proceedings, 27th October 1835, No. 37.
- No. 297. Letter from Collector of Calcutta, dated 22nd April 1835, to Secretary to Military Board, transmitting the Paper marked No. 297. a.
- Ditto ditto, No. 38.
- No. 297. a. Statement exhibiting the Receipts of the amount of Tolls at the Chowkies on the Circular and Entally Canals, from August 1834 to March 1835, inclusive.
- Ditto ditto, No.
- No. 298. Letter from Superintending Engineer, L. P., dated 24th April 1835, to Secretary to Military Board, transmitting the Paper marked 298. a.
- Ditto ditto, No. 39.
- No. 298. a. Table shewing the number of Boats that have passed through the Chitpore Locks, from the 29th August 1834 to 31st of March 1835, inclusive.
- Ditto ditto, No.
- No. 299. Table shewing the number of Boats that have passed through the Chitpore Locks, from 1st of April to 30th June 1835, by the Superintendent of Canals.
- Ditto ditto, No. 40.
- No. 300. Table shewing the number of Boats that passed through the Circular Canal, from July 1833 to April 1835.
- Ditto ditto, No. 41.
- No. 301. Letter from Secretary to Military Board, dated 8th July 1835, to Collector of Calcutta, requesting him to furnish a supplemental statement of the Tolls collected during the months of April last in the Circular and Entallee Canals, and to state whether the amount of Tolls specified in the Statement of the 11th August 1834, and that above quoted contains the gross or net amount of Tolls realized.
- Ditto ditto, No.
- No. 302. Letter from Collector of Calcutta, dated 13th July 1835, to the Secretary to the Military Board, transmitting the Paper marked No. 302. a.
- Ditto ditto, No. 42.
- No. 302. a. Supplementary Statement, exhibiting the Receipts of the Amount of Tolls at the Chowkee on the Circular and Entallee Canals, from 1st to 30th of April 1835.
- Ditto ditto, No.

Military Board's Proceedings, 27th October 1835, No. 43.	No. 303. Statement, exhibiting the Receipts of the Amount of Tolls at the Chowkee on the Circular and Entallee Canal, from 31st November 1834, to April 1835.
Ditto ditto, No. 44.	No. 304. Statement of Rents collected by the Aumeen, from the tenants occupying the Surplus Lands along the Circular Canal. ..
Ditto ditto, No. 45.	No. 305. Statement, exhibiting the receipt of Rent of the Surplus Land leased on the sides of the Circular Canal, from January 1834 to 30th April 1835, furnished by the Record-keeper in charge for collection, dated 28th July 1835.
Ditto ditto, No.	No. 306. Letter from Secretary to Military Board, dated 21st July 1835, to Civil Auditor, requesting him to furnish a Statement of the Staff Salary Bills of the Superintendent of the Circular and Eastern Canals.
Ditto ditto, No.	No. 307. Letter from Secretary to Military Board, dated 24th July 1835, to the Civil Auditor, requesting him to furnish a Statement of the Staff Salary Bills of the Agent, for Iron Suspension Bridges.
Ditto ditto, No.	No. 308. Letter from Civil Auditor, dated 28th July 1835, to Secretary to Military Board, furnishing the information called for, in the Paper marked No. 306.
Ditto ditto, No.	No. 309. Letter from Civil Auditor, dated 31st July 1835, to Military Board, furnishing the information called for in the Paper marked No. 307.
Ditto ditto, No. 48.	No. 310. Summary of the Expense of constructing the Circular Canal, from its commencement in 1823-24 to 1st May 1835, amounting to Rs. 14,43,473 : 11 : 1½.
Ditto ditto, No. * Which it is believed cost only Rs. 10,771—See Revenue Consultation 5th May, 1829, Nos. 1. and 2.—J. M.	No. 311. Summary of the Expense of constructing the Soondurbun Canal, from its commencement in 1823-24 to 1st May 1835, amounting to Rs. 3,33,650 : 15 : 8¼, exclusive of Ground.* ..
Ditto ditto, No.	No. 312. Summary of the Expense of maintaining the Entallee and Ballia-ghata Canals, from 1823-24 to 1834-35, amounting to Rs. 52,142 : 2 : 5¼.
Ditto ditto, No.	No. 313. Statement, shewing the proportion of the Establishment Charges borne by the different branches of the Canals, and that of the Superintendent of Canals.
Ditto ditto, No.	No. 314. Statement of the Canal Committee's Office Establishment, from 1822-23 to 1830-31.
Ditto ditto, No.	No. 315. Letter from Secretary to Military Board, dated 25th October 1835, to Collector of Calcutta, requesting to be furnished with

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a Statement of the monthly charge incurred for collecting the Tolls on the Circular Canal.	
No. 316. Letter from Collector of Calcutta, dated 2d November 1835, to Secretary to Military Board, transmitting the Paper marked No. 316. a.	Military Board's Proceedings, 27th October 1835, No. 49.
No. 316. a. Statement, exhibiting the Receipts of the amount of Tolls at the Chowkey in the new Circular Canal, from the date of the opening of the Canal till the 30th of April 1835.	Ditto ditto, No. 50.
No. 317. Ditto—Abstract of works necessary for putting in repair the Canals and works connected with them.	Ditto ditto, No.
No. 318. Extract of a Letter from the Superintendent of Canals No. 162, of 1st April 1835, to the address of the Superintending Engineer, L. P.	Ditto ditto, No.
No. 319. Letter from the Military Board, dated 27th October 1835, to the Honorable the Governor of Bengal, with reference to the Paper marked No. 296, reports upon the degree of benefit derived from the Circular Canal, and the expediency of keeping it open, with establishments, &c. upon its present footing, and transmits the Papers marked No. 288. No. 295. No. 300. to No. 304. No. 310. No. 313. No. 314. No. 317. and No. 318.	Ditto ditto, No. 51.
No. 320. Remarks by the Superintendent of Canals on the Military Board's Report on the Circular Canal marked No. 319. ..	Ditto ditto, No.
No. 321. Minute by the Chief Magistrate, with reference to the Board's Report of the 27th October last, urging that the affairs connected with the Tolls be brought to such an issue, that Government may derive something like an adequate return for the outlay expended on the Canal.	
No. 322. Letter from Dwarkanath Tagore, Esq., dated 20th January 1836, to D. M'Farlan, Esq. on the subject of the payment of Tolls on the Circular and Balliaghatta Canals.	Ditto ditto, No.
No. 323. Letter from Secretary to Government, dated 16th September 1835, to Military Board, transmitting the Papers marked No. 323. a., No. 323. b. and No. 323. c.	Ditto, 30th October 1835, No. 38.
No. 323. a. Letter from G. A. Prinsep, Esq., dated 5th September 1835, to the Secretary to Government, submitting the remarks and observations made by him on the 19th ultimo, relative to the rules laid down for the future guidance of the Superintendent of Canals, in respect to the opening and shutting of the Lock	Ditto ditto, No.

- Gates, and for reasons assigned, suspends taking measures to dismantle the works at Balliaghaut.
- Military Board's
Proceedings, 30th
Oct. 1835, No. No. 323. *b.* Letter from G. A. Prinsep, Esq., dated 15th September 1835, to Secretary to Government, with reference to his, Mr. Prinsep's, Letter of the 5th instant, submits a proposition for renting the Tolls of the Canals, and states conditions.
- Ditto ditto, No. No. 323. *c.* Letter from Secretary to Government, dated 16th September 1835, to G. A. Prinsep, Esq., in reply to his Letters of the 5th and 15th instant, states, that his representation relative to the Chitpore Lock Gates will be forwarded to the Military Board for their consideration, and refers him to the Collector, with respect to his offer to farm the Tolls of the Canal.
- Ditto ditto, No. 7. No. 324. Letter from Secretary to Government, dated 17th November 1835, to Military Board, in reply to their Letter of the 27th October relative to the Circular Canal, states, that Government are disposed to sanction generally the proposed experiment of consolidating the Tolls levied in the Balliaghatta Canal with that now exacted at the junction of the Circular with the Balliaghatta Canal, and requests to know the amount of Toll proposed to be levied at each extremity of the general line, and sanctions the outlay proposed.
- Ditto ditto, No. 2. No. 325. Letter from Secretary to Government, dated 11th November 1835, to Military Board, in reply to their Letter, No. 3,615, of the 30th ultimo, requests to know what steps they have taken in regard to the Bund or Tow-path in the Salt Water Lakes, and if commenced, by what time it is likely to be completed.
- Ditto, 15th December 1835, No. 55. No. 326. Letter from Superintending Engineer, L. P., dated 15th October 1835, to Secretary to Military Board, transmitting the Bill of the Superintendent of Canals, for constructing the Cess Pool in the Entallee Canal, and partly cleaning it out, amounting to Rs. 732:9:0, and stating, that the Bill is accompanied by a competent Survey Report.
- Ditto ditto, No. No. 327. Letter from Secretary to Military Board, dated 15th December 1835, to the Governor of Bengal, transmitting the Bill referred to in the Paper marked No. 326, and recommending that it be passed.
- Ditto ditto, No. No. 328. Letter from Military Board, dated 15th December 1835, to the Governor of Bengal, reporting on the Entallee and Balliaghatta Canals, and requesting sanction to the disbursement of Rs. 8,280, for the execution of repairs necessary to preserve the Communication of those Canals in an efficient state, and

stating, that they will shortly submit decisive measures for the future regulation of Tolls on those Canals.

- No. 329. Letter from Superintendent of Canals, dated 20th November 1835, to Superintending Engineer, L. P., reporting the progress that has been made in constructing the Tow-paths in the Salt Water Lakes, and stating, that the Proprietors of the Fisheries of the Lake have started an objection to the shutting up of the Nullahs of the Lake Channel.
- Military Board's
Proceedings, 22nd
December 1835,
No. 59.
- No. 330. Letter from Secretary to Government, dated 22nd December 1835, to the Military Board, in reply to their Letter of the 15th instant, sanctions the Disbursement of the sum not exceeding Rs. 8,280, for placing the communication upon the Balliaghatta and Entallee Canals in an efficient state, as recommended by the Board; viz.
- | | | |
|---|-----------|-----|
| Cleaning out the Dhurumtollah Cess Pool, | Rs. 550 | 0 |
| Excavating the Canal West of the Koolyah Bridge, | 3,380 | 0 |
| Repairing and Draining the Banks of the Entallee Canal, ... | 850 | 0 0 |
| Repairing the Pucka Road along the Banks of ditto, ... | 500 | 0 0 |
| Cutting down, levelling, and repairing the Slopes and Drains of the Balliaghatta Canal, ... | 3,000 | 0 0 |
| | Rs. 8,280 | 0 0 |
- No. 331. Letter from Secretary to Military Board, dated 29th September 1835, to the Agent for Iron Suspension Bridges, requesting him to furnish a Statement of the number and description of Bridges made up in the Iron Suspension Bridge Yard, since its first establishment to the 1st of May 1835, and cost of their construction, including all charges, except that of the monthly establishment.
- Ditto, 15th January 1836, No. 40.
- No. 332. Letter from the Agent for Iron Suspension Bridges, dated 9th October 1835, to the Superintending Engineer, L. P., transmitting, with observations, the Paper marked No. 332. a.
- Ditto ditto, No. 41.
- No. 332. a. Statement shewing the number of Bridges made at the Allypore Iron Bridge Yard, and the expense incurred thereon, from the first establishment of the Yard in 1823 to the 1st of May 1835.
- Ditto ditto, No. 42.
- No. 333. Letter from the Military Board, dated 15th January 1836, to the Governor of Bengal, transmitting, with observations, the Papers marked No. 332. and No. 332. a.
- Ditto ditto, No. 43.
- No. 334. Letter from the Chief Magistrate, dated 24th February 1836, to the Secretary to Military Board, relative to the present state of
- Ditto, 1st March 1836, No. 18.

the Dhurumtollah Main Drain, which he states has been shut up for more than a month by Captain Thomson, on account of the operations going on for clearing the Entally Canal. ..

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| <p>Military Board's
Proceedings, 1st
March 1836, No.
20.</p> | <p>No. 335. Letter from the Secretary to Military Board, dated 1st March 1836, No. 6,086, to the Superintendent of Canals, transmitting the Paper marked No. 334.</p> |
| <p>Ditto, 4th March
1836, No. 42.</p> | <p>No. 336. Letter from Superintendent of Canals, dated 4th March 1836, to the Secretary to Military Board, in reply to his Letter No. 6086, communicates on the subject of letting off the water accumulated in the Dhurumtollah Drain.</p> |
| <p>Ditto, 15th March
1836, No. 3.</p> | <p>No. 337. Letter from Secretary to Government, dated 9th March 1836, to Military Board, in reply to their Letter No. 6,103 of 4th instant, authorizes an advance of Rs. 3,275, in favor of Superintendent of Canals, on account of making two Tow-paths in the Salt Water Lake.</p> |
| <p>Ditto, 29th March
1836, No. 68.</p> | <p>No. 338. Letter from Superintendent of Canals, dated 11th March 1836, to Superintending Engineer, L. P., on the subject of his Bills for making Tow-paths to the Sunderbund Canals.</p> |
| <p>Ditto, 8th April
1836, No. 58.</p> | <p>No. 339. Letter from Superintendent of Canals, dated 3rd February 1836, to Superintending Engineer, L. P., transmitting a revised Estimate of the probable expense of cleaning out the Entally Canal, from the Dhurumtollah Drain to the Coolya Bridge, and Draining and Repairing the Road on its Banks, amounting to Co's. Rs. 10,414, and a revised Estimate of probable expense of making embankments on the sides of the Lake Channel, amounting to Co's. Rs. 4,825.</p> |
| <p>Ditto, 12th April
1836, No. 58.</p> | <p>No. 340. Letter from Superintendent of Canals, dated 13th February 1836, to the Secretary to Military Board, reporting, that the rain has broken down both the Dams on the Dhurumtollah Drain, and swept away the Rivetment which forms the Cess Pool at the mouth of the Drain, and remarking, that under the present system, the digging out of the Entallee Canal, as it becomes filled with mud, cannot be continued any longer.</p> |
| <p>Ditto ditto, No. 60.</p> | <p>No. 341. Letter from Military Board, dated 4th March 1836, No. 6,143, to the Governor of Bengal, transmitting the Paper marked No. 340, with observations, and stating that the probable cost of rebuilding the wall of the Dhurumtollah Cess Pool will be Rs. 550.</p> |
| <p>Ditto ditto, No. 65.</p> | <p>No. 342. Letter from Superintendent of Canals, dated 11th March 1836, to Superintending Engineer, L. P., transmitting, with observations, the Paper marked No. 342. a.</p> |

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No. 342. <i>a.</i> Estimate of the probable expense of rebuilding in the Entally Canal the Cess Pool of the Dhurrumtollah Drain, amounting to Co's Rs. 554 : 14 : 1.	Military Board. Proceedings 12th April 1836, No. 65.
No. 343. Letter from Secretary to the Government of Bengal, dated 22nd March 1836, to Military Board, in reply to their Letter No. 6,143, of the 4th Instant, authorizes the Superintendent of Canals to re-construct the wall of the Dhurrumtollah Cess Pool, which was carried away by the heavy showers of rain in February last, at an expense not exceeding Co's. Rs. 550, as recommended by the Board.	Ditto ditto, No. 61.
No. 344. Letter from Superintendent of Canals, dated 10th August 1836, to the Superintending Engineer, L. P., relative to the necessity of enacting some regulations for the preservation and better management of the Canals under his charge.	Ditto, 29th April 1836, No. 38.
No. 345. Letter from Secretary to Military Board, dated 28th August 1835, to Secretary to Sudder Board of Revenue, requesting to be favored with certain Papers relative to the better regulation of Tolls, Boats, &c. in the Entally and other Canals. ..	Ditto ditto, No. 39.
No. 346. Letter from Secretary to Sudder Board of Revenue, dated 4th September 1835, to Secretary to Military Board, transmitting the Papers marked No. 346, <i>a.</i> to No. 346, <i>c.</i> inclusive. ..	Ditto ditto, No. 40.
No. 346. <i>a.</i> Minute, dated 29th January 1834, by W. W. Bird, Esq., submitting with observations, the Paper marked No. 346. <i>a.</i> ⁽¹⁾	Ditto ditto, No. 41.
No. 346. <i>a.</i> ⁽¹⁾ Draft of a proposed Regulation for regulating the Tolls, and securing the unimpeded Navigation of the Balliaghatta and Circular Canals.	Ditto ditto, ditto.
No. 346. <i>b.</i> Minute by James Pattle, Esq., dated 27th February 1834, submitting with observations, the Paper marked No. 346. <i>b.</i> ⁽¹⁾	Ditto ditto, ditto.
No. 346. <i>b.</i> ⁽¹⁾ Draft of a proposed Regulation for levying the Tolls and for improving the Navigation of the Balliaghatta and Circular Canal and Eastern Canal, commonly called Tolly's Nullah, and all the artificial and natural Canal and Channels connecting the Balliaghatta and Eastern Canals with the Issamuttee River.	Ditto ditto, ditto.
No. 346. <i>c.</i> Letter from Acting Secretary to Sudder Board of Revenue, dated 1st April 1834, to the Secretary to the Government, Revenue Department, transmitting, with observations, the Papers marked No. 346. <i>a.</i> to No. 346. <i>b.</i> ⁽¹⁾ inclusive. ..	Ditto ditto, ditto.
No. 347. Minute by D. McFarlan, Esq., dated 8th July 1835, relative to the Establishment kept up on account of letting out and re-	Ditto ditto, No. 42.

	ceiving the Rents, &c. of the Surplus Ground of the Circular Canal.
Military Board's Proceedings, 29th April 1836, No. 43.	No. 348. Letter from Secretary to Military Board, dated 17th July 1835, transmitting Copy of the Paper marked No. 347, and stating that the Board are anxious to make over to the Chief Magistrate's charge the whole of the Surplus Lands of the Circular Canal, together with the Documents relative thereto. ..
Ditto ditto, No. 44.	No. 349. Letter from Secretary to Military Board, No. 6790, dated 5th April 1836, to Superintendent of Canals, requesting his opinion upon certain points connected with the Papers marked No. 346. a. to No. 346. c. inclusive. .. .
Ditto ditto, No. 45.	No. 350. Letter from Superintendent of Canals, dated 11th April 1836, to Secretary to Military Board, replying to his Letter, No. 6790, marked No. 349.
Ditto ditto, No. 46.	No. 351. Letter from Military Board, dated 29th April 1836, to the Governor of Bengal, with reference to Mr. Secretary Mangles' Letter No. 1,272, of the 17th November last, relative to the amount of Toll it would be expedient to levy at each end of the Circular and Balliaghatta Canal, submit their observations, and transmit the Papers marked No. 349. to No. 350. ..
Ditto, 1st July 1836, No.	No. 352. Letter from Superintending Engineer, L. P., dated 21st May 1836, to Secretary to Military Board, transmitting a Bill amounting to Rupees 540 : 7 : 9, by the Superintendent of Canals, for rebuilding in the Entally Canal the Cess Pool to the Dhurumtollah Drain.
Ditto, 29th July 1836, No. 37.	No. 353. Letter from Secretary to Government of Bengal, dated 9th July 1836, to Military Board, requesting them, in communication with James Prinsep, Esq. to direct their attention to a Draft of a proposed Canal Act, published in the Calcutta Gazette, of the 6th instant, and requesting their sentiments thereon. ..
Ditto ditto, No. 38.	No. 354. Letter from James Prinsep, Esq., dated 20th July 1836, to Assistant Secretary to Military Board, transmitting the Paper marked No. 354. a.
Ditto ditto, No. 39.	No. 354. a. Memorandum on the Draft of an Act for regulating the Tolls on the Circular Canal and Tolly's Nulla, dated 10th July 1836, by James Prinsep, Esq.
Ditto ditto, No. 40.	No. 355. Letter from Military Board, dated 29th July 1836, to the Governor of Bengal, replying to Mr. Secretary Mangles' Communication of the 9th instant, No. 986, and transmitting the Paper marked No. 354. a.

- No. 356. Letter from Superintending Engineer, L. P., dated 24th June 1836, to the Secretary to the Military Board, transmitting with observations, the Papers marked No. 356. *a.* to No. 356. *d.* ...
 Military Board's Proceedings, 12th August 1836, No. 49.
- No. 356. *a.* Letter from Superintendent of Canals, dated 6th June 1836, to Superintending Engineer, L. P., with reference to his Letter of the 14th ultimo, resumes the subject of the consideration of the best manner of removing and preventing the Mud brought into the Canals by the Town Drains.
 Ditto ditto, ditto.
- No. 356. *b.* Letter from Superintendent of Canals, dated 17th June 1836, to Superintending Engineer, L. P., in answer to his Letter No. 640, states a few cases in which a Dredging Boat would be a great convenience, and so far economical as to cover the expense of it.
 Ditto ditto, ditto.
- No. 356. *c.* Memorandum of the Steam Dredging Vessel, dated 27th May 1836. '
 Ditto ditto, ditto.
- No. 356. *d.* Letter from Superintendent of Canals, dated 17th June 1836, to Superintending Engineer, L. P., in reply to his Letter of the 15th instant, submits to his consideration the Plan he proposed adopting for bringing forward the scheme of altering the Drains running into the Circular Canals.
 Ditto ditto, ditto.
- No. 357. Letter from Secretary to Military Board, dated 12th August 1836, to Superintending Engineer, L. P., with reference to his Letter of the 24th June, requests him to call on the Superintendent of Canals to furnish a more accurate and detailed specification of the works he proposes.
 Ditto ditto, No.
- No. 358. Letter from Superintending Engineers, L. P., 25th June 1836, to Secretary to Military Board, submitting a detail of the present state of the several Canal works in progress, and transmitting the Papers marked No. 358. *a.*, No. 358. *b.* and No. 358. *c.*
 Ditto, 16th August 1836, No. 48.
- No. 358. *a.* Letter from Superintendent of Canals, dated 11th May 1836, to Superintending Engineer, submitting a detail of the state and progress of the works which were authorized to be done to the Canals, &c. .. .
 Ditto ditto, ditto.
- No. 358. *b.* Letter from Superintending Engineer, L. P., dated 19th May 1836, to Superintendent of Canals, requesting him to furnish a detailed Report of his intended operations on the Canals for the ensuing season.
 Ditto ditto, ditto.
- No. 358. *c.* Letter from Superintendent of Canals, dated 24th May 1836, to Superintending Engineer, L. P., stating, that previous to giving a detailed reply to his Letter of the 19th instant, he

begs to observe, that to improve the management of the Canals and to Estimate with any certainty the probable expense before hand, it is necessary to accumulate a large number of facts, and refers to the 2nd Para. of His Letter of the 19th January 1836.

Military Board's
Proceedings, 16th
August 1836, No.

No. 359. Letter from Secretary to Military Board, dated ——— No. 2556, to the Superintending Engineer, L. P., in reply to his Letter No. 1204, of the 28th July last, transmitting a report by the Superintendent of Canals, on the state of the Sunderbund Canals, states, that the Board will await the receipt of Estimates on the several works proposed to be executed by that Officer, and that the Board will be glad to receive fuller explanations on the cause of the current running up the Lake Channel for an hour after high water.

Ditto ditto, No.

No. 360. Letter from Military Board, dated 16th August 1842, to the Right Honorable the Governor of Bengal, transmitting the Papers marked No. 358, No. 358, a. to No. 358, c. inclusive.

Ditto, 9th September
1836, No. 23.

No. 361 Letter from Superintendent of Canals, dated 26th August 1836, to Superintending Engineer, L. P., stating, that it is not in his power to transmit Estimates of the expense of keeping the Circular Canal free from Silt, that since the opening of the Canal Locks he considers the proposition for altering the Town Drains to prevent their bringing Mud into the Canal most important to the prosperity of the Circular Canal.

Ditto, 14th October
1836, No.

No. 362. Letter from Military Board, dated 14th October 1836, to the Governor of Bengal, in continuation of their letter of the 16th August last, recommend, in consequence of an error in the Estimate No. 67, authorised on the 30th August last, that the additional Sum of Rs. 1,350, be sanctioned for the repairs of the Canal.

Ditto, 2nd December
1836, No. 31.

No. 363. Letter from Secretary to Government of Bengal, dated 1st November 1836, to Military Board, transmitting the Papers marked No. 363. a., to No. 363. g. inclusive, and referring them to the Extra Government Gazette of the 1st instant, where Act No. XXII, of 1836, is printed; and requests the Board will assume the general Fiscal as well as Conservative Superintendence of the several lines of the Circular and Eastern Canals, specified in Act No. XXII, of 1836, and requesting a Report, whether Rules of the nature of those Drafted relative to Tolls, might not advantageously be generally introduced for the Trade of the City and Port.

Ditto ditto, No. 32.

No. 363. a. Letter from Secretary to Government of Bengal, dated 27th September 1836, addressed respectively to D. McFarlan, Esq.,

Lieut. Col. J. Craigie, Major Irvine, and Captain Thomson, appointing them a Committee to consider and report in which way the provisions of the Act passed by the Supreme Government on the 26th instant, may most beneficially be carried into effect.

No. 363. *b.* Letter from the Committee referred to in the Paper marked No. 363, *a.* dated 26th October 1836, to the Governor of Bengal, reporting on the subjects referred to them, and transmitting the Papers marked No. 363. *b.*(1) to No. 363. *b.*(6) inclusive. ..

No. 363. *b.*(1) Table of Tolls proposed to be posted up at each Toll House.

No. 363. *b.*(2) Proposed Rules for the guidance of the Officer in charge of the Collections of the Tolls.

No. 363. *b.*(3) Proposed Rules for the guidance of the Toll-keeper. ..

No. 363. *b.*(4) Estimate for building Toll Houses.

No. 363. *b.*(5) Proposed Rules for the supervision and preservation of the Navigation of the Canal.

No. 363. *b.*(6) Statement of the Establishment necessary for the supervision and preservation of the Canal.

No. 363. *c.* Letter from Secretary to Government of Bengal, dated 29th October 1836, to the Canal Committee, acknowledging the receipt of their able Report of the 26th instant, and stating, that His Lordship entirely approves the rates of Tolls and Rent which they have proposed, and transmitting certain instructions for their guidance.

No. 363. *d.* Letter from Secretary to Government of Bengal, dated 29th October 1836, to the Commissioner of Jessore, informing him, that it is the intention of the Governor of Bengal to appoint on the 1st proximo, Captain John Thomson, Engineers, to be Collector of the Tolls and Rent throughout the lines of Canal, specified in Section II. No. 22, of 1836, and requesting him to instruct the Officiating Collector of the 24-Pergunnahs, to make over charge of the above to Captain Thomson, on the above date.

No. 363. *e.* Letter from the Canal Committee, dated 31st October 1836, to the Governor of Bengal, in reply to the Letter of the Secretary to the Government of Bengal, dated 29th instant, transmits the Paper marked No. 363, *e.*(1)

No. 363. *e.*(1) Notification of the Appointment of the Collector of Tolls

Military Board's
Proceedings,
December 18

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, ditto.

and Rent on the Canals, with a copy of Appendix 'A', to the Committee's Report modified as directed, and situations of the Toll Houses added. .. .

Military Board's
Proceedings, 2nd
December 1836,

No. 363. *f.* Letter from Secretary to Government of Bengal, dated 1st November 1836, to the Canal Committee, communicating the observations and orders of Government upon their Report of the 26th ultimo, in continuation of his Letter of the 29th idem. .. .

Ditto ditto, No.

No. 363. *g.* Letter from Secretary to Government of Bengal, dated 1st November 1836, to Captain Thomson, stating, that the Governor of Bengal having been pleased to entrust to the Military Board the general Fiscal as well as Conservative superintendence of the several lines of Canals specified in Act No. XXII, of the current year, he is requested to place himself under their orders. .. .

Ditto ditto, No.

No. 364. Letter from Secretary to Military Board, dated 2nd December 1836, to Captain Thomson, transmitting for his consideration, Draft of certain Rules regarding the Collection of Tolls, which it is under contemplation to enforce on the Canals under his charge, and requesting him to report upon the above Rules. ..

Ditto, 20th January 1837, No. 57.

No. 365. Letter from Superintending Engineer, L. P., dated 13th October 1836, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, for expense incurred in cleaning out the Dhurruntollah Cess Pool, and excavating the Canal West of Cooleah Bridge, and repairing and Draining the Bank of the Entally Canal, and repairing the Pucka Road along its Banks, amounting to Co's. Rs. 5,480 : 1 : 3, also a Bill for Levelling and Draining the Eastern and Western Banks of the Circular Canal, amounting to Rupees 3,094 : 15 : 10. ..

Ditto ditto, ditto.

No. 366. Letter from Secretary to Military Board, dated 2nd December 1836, to Superintending Engineer, L. P., returning the two Bills transmitted in the Superintendent's Letter of the 13th ultimo, and requesting him to furnish the Board with the result of his observations on the manner in which the Works charged in the above Bills, have been executed, and to report generally on the Works in progress under the Superintendent of Canals. .. .

Ditto ditto, No. 58.

No. 367. Letter from Superintending Engineer, L. P., dated 24th December 1836, to Secretary to Military Board, in reply to Board's Letter No. 4,239, of the 2nd instant, returns Bills by Captain Thomson, for certain repairs, &c. to the Circular and Entally Canals with his opinion, and reports on the progress made in the Works sanctioned for the improvement of the Canals. ..

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- No. 368. Letter from Secretary to Military Board, dated 20th January 1837, to Superintending Engineer, L. P., stating that the Bills transmitted in his Letter of 2nd December 1836, have this day been passed by the Board, and transmitted for adjustment to the Office of the Accountant General.
- Military Board's
Proceedings, 20th
January 1837, No. .
- No. 369. Letter from Superintendent of Canals, dated 5th December 1836, to Secretary to Military Board, stating, that up to the 1st November 1836, a Toll of 4 Annas was collected from every loaded Boat or Saultee that navigated the Kamapookerya Khal, and the annual produce of this Toll has been estimated at 10,000 to 8,000 Sicca Rupees ; that if the Board are of opinion that the Kamapookerya Khal forms, or may be considered as a part of Tolley's Nullah, which it is very necessary it should be, that he will in that event levy Toll on the same from the 1st instant.
- Ditto 27th January
1837, No. 32.
- No. 370. Letter from Secretary to Military Board, dated 20th December 1836, to Superintendent of Canals, in reply to his Letter of the 5th instant, requests him to state in what manner the Boats belonging to the Kamapookerya Khal can be distinguished from those which navigate Tolley's Nullah, and how he proposes to levy Rent on the former, and whether there is any objection to levying Toll on Boats passing out of the Khal. . .
- Ditto ditto, No. 33.
- No. 371. Letter from Superintendent of Canals, dated 23rd December 1836, to Secretary to Military Board, in reply to his Letter of the 20th instant, states, that the Boats belonging to the Kamapookerya Nullah cannot be distinguished from other Boats, but he proposes to apply the same rule to them as to any other Boats found in the Canal without a Ticket ; that the expense of collecting the Toll at the mouth of the Kamapookerya Nullah would be greater than the amount of Toll that could be realised. . .
- Ditto ditto, No. 34.
- No. 372. Letter from Secretary to Military Board, dated 6th January 1837, to Superintendent of Canals, with reference to his Letter of the 23rd ultimo, requests him to state how far the Toll he proposes to levy will affect the Proprietors of Boats in the Kamapookerya Khal, and whether the Toll now proposed to be levied will give a higher amount than that formerly received.
- Ditto ditto, No. 35.
- No. 373. Letter from Superintendent of Canals, dated 14th January 1837, to Secretary to Military Board, in reply to his Letter of the 8th [6th] instant, states, that 9-10th of the traffic in the Kamapookerya Khal is carried on in Saultees, or Boats under 25 maunds burthen, and that the few Boats in excess of this burthen will be driven out of the Trade ; that formerly about Rupees 10,000 a year must have been realized by Toll from the above Khal, and that there will now be nothing.
- Ditto ditto, No. 36.

- Military Board's Proceedings, 27th Jan. 1837, No. 37.** No. 374. Letter from Superintendent of Canals, dated 5th January 1837, to Secretary to Military Board, stating, that the Ferries on Tolley's Nullah and Balliaghatta Canal have been transferred to his charge by the Collector of Calcutta; that he had farmed the Ferries, the former for 3 years at Rs. 101, per annum, and the latter had been farmed by the Sudder Board on the 13th January 1833, for Sicca Rupees 441 a-year, for 6 years. . .
- Ditto ditto, No. No. 375. Letter from Secretary to Military Board, dated 27th January 1837, to Superintendent of Canals, stating, that it appears very objectionable that the rate of any Ferry should not be specifically known, and requesting him to state what he thinks should be the rate of Toll levied at the Ferries in question.
- Ditto 17th February 1837, No. 67. No. 376. Letter from Superintendent of Canals, dated 2nd January 1837, to Secretary to Military Board, proposing a modification and increase to his Office establishment with reference to the great increase of business arising from the Collection of Tolls. .
- Ditto 28th February 1837, No. 37. No. 377. Letter from Secretary to the Government of Bengal, dated 8th December 1836, transmitting the Papers marked No. 377. a. and No. 377. a.⁽¹⁾, and requesting a Report on the same. . .
- Ditto ditto, ditto. No. 377. a. Letter from Messrs. Carr, Tagore and Co., dated 7th December 1836, to the Private Secretary to the Governor General, transmitting the Paper marked No. 377. a.⁽¹⁾
- Ditto ditto, ditto. No. 377. a.⁽¹⁾ Letter from Messrs. Carr, Tagore and Co., dated 7th December 1837, to the Governor General of India in Council, representing the hardship sustained by them from a change in the Toll rates on Tolley's Nullah, which they did not anticipate when they undertook the contract for supplying Coal to Government.
- Ditto ditto, No. No. 378. Letter from Secretary to Military Board, dated 18th December 1836, No. 4444, to the Superintendent of Canals, transmitting the enclosures referred to in the Paper marked No. 377, and requesting a Report on the same.
- Ditto ditto, No. 38. No. 379. Letter from Superintendent of Canals, dated 17th December 1836, to the Secretary to Military Board, in reply to his Letter of the 18th instant, reports on the subject of the Toll paid by Messrs. Carr, Tagore and Co.
- Ditto ditto, No. 39. No. 380. Letter from Superintendent of Canals, dated 29th November 1836, to the Secretary to the Military Board, transmitting the Paper marked No. 380. a.
- Ditto ditto, ditto. No. 380. a. Petition of a number of Merchants residing near Tolley's

Nullah, stating their grievances in respect to the change in the system of collecting the Tolls on the Canal. A free translation of the above Petition is annexed, prepared in the Military Board's Office.

No. 381. Letter from Secretary to Government of Bengal, Revenue Department, dated 20th December 1836, to Military Board, transmitting the Paper marked No. 381. a.

Military Board's
Proceedings, 28th
Feb. 1837, No. 40.

No. 381. a. Letter from the Secretary to the Military Orphan Society, dated 15th December 1836, to Secretary to Government of Bengal, representing, that the new rates of Tolls have proved ruinous to the Orphan Society's Bazar at Kidderpore, and soliciting a reduction of the charge to its former rate.

Ditto ditto, ditto.

No. 382. Letter from Secretary to Military Board, dated 3rd January 1837, to Superintendent of Canals, with reference to his, the Secretary's, Letter of the 18th ultimo, transmits the Paper marked No. 381. a.

Ditto ditto, No. 41.

No. 383. Letter from Secretary to Government of Bengal, dated 27th December 1836, to Military Board, transmitting the Paper marked No. 383. a.

Ditto ditto, No. 42.

No. 383. a. Petition from certain Native Merchants, complaining of the rates of Tolls levied on Boats in Tolley's Nullah, and the obstructed state of the Nullah.

Ditto ditto, ditto.

No. 384. Letter from Superintendent of Canals, dated 5th January 1837, to Secretary to Military Board, in reply to his Letter of the 3rd instant, submits his opinion relative to the representation made by the Secretary to the Military Orphan Society, respecting the injurious effect which the new rates of Toll charged on Boats entering Tolley's Nullah from the Hooghly are producing on the traffic of the Orphan Gunge or Bazar. ..

Ditto ditto, No. 43.

No. 385. Letter from Secretary to Government of Bengal, dated 10th January 1837, to Military Board, transmitting the Paper marked No. 385. a.

Ditto ditto, No. 44.

No. 385. a. Letter from Secretary to the Military Orphan Society, dated 6th January 1837, to Secretary to Government of Bengal, in reply to his Letter of the 2nd ultimo, submits Statements shewing the injurious effect which the new rates of Toll have on the proceeds of the Orphan Gunge or Bazar at Kidderpore.

Ditto ditto, ditto.

No. 386. Letter from Military Board, dated 3rd February 1837, No. 5411, to Governor of Bengal, replying to Mr. Secretary Mangles' Letter of the 8th December last and its enclosures.

Ditto ditto, No. 45.

Military Board's
Proceedings, 28th
Feb. 1837, No. 45.

- No. 387. Letter from Military Board, dated 3rd February 1837, No. 5412, to the Governor of Bengal, in reply to Mr. Secretary Mangles' Letter of the 20th December last, transmits the Paper marked No. 384, and states, that, under the circumstances noticed in the above Paper, they do not think the Orphan Society have any just ground of complaint, and consequently the Board are not prepared to make any change in the rates of Tollage.
- Ditto ditto, ditto. No. 388. Letter from Military Board, dated 3rd February, 1837, No. 5414, to the Governor of Bengal, replying to Mr. Secretary Mangles' Letter No. 1892, of the 27th December last, ...
- Ditto ditto, ditto. No. 389. Letter from Secretary to Military Board, dated 3rd February, 1837, No. 5413, to Superintendent of Canals, replying to his Letter of the 29th November last, and directing his attention to certain suggestions for improving the Nullah.
- Ditto ditto, No. 46. No. 390. Letter from Superintendent of Canals, dated 21st February 1837, to the Secretary to Military Board, replying to his Letter No. 5413, of the 3rd instant, and suggesting the means of preserving the [Tolley's] Nullah from the effects of silting, and stating that the Current through the Nullah appears amply sufficient to preserve any depth that may be given to it.
- Ditto ditto, No. 49. No. 391. Letter from Secretary to Military Board, dated 10th February 1837, to the Superintendent of Canals, requesting him to state, what would be the probable effect on Tolley's Nullah if the Navigation from the Hooghly to the Kidderpore Bridge were declared free, and the Toll House were removed to the North of that Bridge, or as far as the Allipore Bridge.
- Ditto ditto, No. 50. No. 392. Letter from Superintendent of Canals, dated 20th February 1837, to Secretary to Military Board, replying to his Letter of the 10th instant marked No. 391.
- Ditto ditto, No. 51. No. 393. Letter from Military Board, dated 28th February 1837, to the Governor of Bengal, in continuation of their Letters No. 5411, and 5412 of the 3rd instant, transmits the Paper marked No. 392, and state that they would not recommend at present modifying in particular localities the existing rates of Toll on Tolley's Nullah.
- Ditto 3rd March 1837, No. 21. No. 394. Letter from Superintendent of Canals, dated 27th February 1837, to Secretary to Military Board, in reply to his Letter No. 5179 of the 27th ultimo, states, that he intends to restrict the charge made by the Farmers of the Canal Ferries to 10 Gundah of Cowries, or $\frac{1}{4}$ of the present charge for each foot passenger.

	Pages.
No. 395. Letter from Superintendent of Canals, dated 4th February 1837, to Secretary to Military Board, transmitting Plan and Estimate of the Docks proposed to be made at the Salt Water Lakes, to prevent the Navigation of the Canals being obstructed, and stating, that Boats entering the Docks will be charged with the usual Toll; but that no charge will be made for Ground occupied by Goods, unless they should be there more than one year; that he proposes to make the Lock Gates to the Docks of the same breadth as those to the Chitpore Lock, in order that the Lock Dam of the latter may fit that of the former.	Military Board's Proceedings, 7th April 1837, No. 6.
No. 396. Letter from Secretary to Military Board, dated 3rd March 1837, to Superintendent of Canals, in reply to his Letter of the 4th ultimo, requests more detailed information relative to the proposed Balliaghatta Docks.	Ditto ditto, ditto.
No. 397. Letter from Superintendent of Canals, dated 8th March 1837, to Secretary to Military Board, furnishing the information requested in the Secretary's Letter of the 3rd instant.	Ditto ditto, ditto.
No. 398. Letter from Military Board, dated 7th April 1837, to Governor of Bengal, transmitting the Papers marked No. 395, and No. 397, and recommending that the Superintendent of Canals' Estimate for the Docks at Chingreehatta, amounting after correction, to Rupees 21,474 : 5 : 6, be sanctioned.	Ditto ditto, ditto.
No. 399. Letter from Superintending Engineer, L. P., dated 28th July 1836, to Secretary to Military Board, transmitting the Paper marked No. 399. a.	Ditto 14th April 1837, No. 37.
No. 399. a. Letter from Superintendent of Canals, dated 16th July 1836, to Superintending Engineer, L. P., reporting on the state of the Soondurbun Canals and Lake Channel.	Ditto ditto, ditto.
No. 400. Letter from Military Board, dated 9th September 1836, to the Governor of Bengal, transmitting the Papers marked No. 399, and No. 399. a.	Ditto ditto, No.
No. 401. Letter from Secretary to Military Board, dated 9th September 1836, to the Superintending Engineer, L. P., in reply to his Letter of the 28th July 1836, states, that the Board will await the receipt of Estimates on the several Works proposed to be executed by that Officer, and that the Board will be glad to receive fuller explanation on the cause of the Current running up the Lake Channel an hour after High Water.	Ditto ditto, No. 39.
No. 402. Letter from Superintending Engineer, L. P., dated 27th September 1836, to Secretary to Military Board, transmitting the Paper marked No. 402. a.	Ditto ditto, No. 42.

Military Board's Proceedings, 14th April 1837, No. 43.	No. 402. <i>a.</i> Letter from Superintendent of Canals, dated 29th August 1836, to Superintending Engineer, L. P., transmitting an Estimate amounting to Rs. 5,414, of the expense of Damming up the Gobrah Khaul, with observations detailing the manner of executing the Work.
Ditto ditto, No. 40.	No. 403. Letter from Superintending Engineer, L. P., dated 24th October 1836, to Secretary to Military Board, transmitting the Paper marked No. 403. <i>a.</i>
Ditto ditto, No. 41.	No. 403. <i>a.</i> Letter from Superintendent of Canals, dated 24th September 1836, to Superintending Engineer, L. P., transmitting the information requested in the Military Board's Letter of the 28th July 1836, to the Superintending Engineer, marked No. 401.
Ditto ditto, No. 44.	No. 404. Letter from Military Board, dated 25th October 1836, to Superintending Engineer, L. P., requesting him to direct the Superintendent of Canals, to furnish a section of the Gobrah Khaul, and Plan and Section of the Dam which he proposes to construct.
Ditto 28th April 1837, No. 43.	No. 405. Letter from Superintendent of Canals, dated 18th February 1837, to Secretary to Military Board, reporting on the extent of the Surplus Land on the Banks of the Circular Canal, and the Rent derived therefrom, with suggestions.
Ditto ditto, No. 44.	No. 405. <i>a.</i> Rates at which the Ground is let on the East Bank of the Circular Canal.
Ditto ditto, ditto.	No. 405. <i>b.</i> Ditto ditto, on the West Bank of the Circular Canal. ..
Ditto ditto, No. 45.	No. 406. Letter from Secretary to Military Board, No. 5928, dated 24th February 1837, to Superintendent of Canals, in reply to his Letter of the 18th instant, requests him to furnish a Statement, exhibiting the name of the renters, situation, and size of each lot; the terms and date of rental, the length of lease, and the date of its expiration.
Ditto ditto, No. * NOTE.—This in- formation consists of 3 sets of Plans, numbered 110 to No. 118.—J. M.	No. 407. Letter from Superintendent of Canals, dated 15th March 1837, to Secretary to Military Board, transmitting the information* required in his Letter No. 5928, of the 24th ultimo.
Ditto 16th May 1837, No. 21.	No. 408. Letter from Secretary to Government of Bengal, dated 7th March 1837, to Military Board, transmitting the Paper marked No. 408, <i>a.</i> and replying to Board's Letters Nos. 5411, 5412, and 5414, of the 3rd, and 5956, of the 28th February 1837; concurring with them, that no partial change of system should be made respecting the Tollage and Collection, and requesting that the several Petitioners, and the Managers of the

Orphan Society be informed accordingly. The case of Messrs. Carr, Tagore and Co. will be referred for consideration to the General Department, and directing that a Report may be furnished half-yearly relative to the produce of Tolls, &c. ..

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| <p>No. 408 a. Letter from Superintendent of Canals, dated 3rd March 1837, to Secretary to Government of Bengal, stating, that as no remuneration will be granted to him for the trouble of taking charge of the Canal Lands, requests that the same may be transferred to the Collector, as was recommended by the Military Board 4 or 5 years ago.</p> | <p>Military Board's
Proceedings, 16th
May 1837, No. 22.</p> |
| <p>No. 409 Letter from Military Board, dated 31st March 1837, to the Governor of Bengal, replying to Mr. Secretary Mangles' Letter of the 7th instant, and recommending that a temporary addition be made to the Salary of the Superintendent of Canals whilst the Tolls are confided to his charge.</p> | <p>Ditto ditto, No. 23.</p> |
| <p>No. 410. Letter from Secretary to Government of Bengal, dated 11th April 1837, to the Military Board, replying to their Letter of the 31st ultimo, and requesting a report on the New system of Canal Management, and the results, Financial and General, of that system.</p> | <p>Ditto ditto, No. 25.</p> |
| <p>No. 411. Letter from Secretary to Military Board, dated 14th April 1837, to Superintendent of Canals, requesting him to submit a Statement of the gross amount of Tolls collected on the Calcutta Canals, since the 1st of November last, the expense of Collection and the Net Proceeds of the Toll.</p> | <p>Ditto ditto, No. 24.</p> |
| <p>No. 412. Letter from Superintendent of Canals, dated 4th May 1837, to Secretary to Military Board, in reply to his Letter of the 14th ultimo, reports on the Canal Tolls, and transmits the Papers marked No. 412. a. to No. 412. c. inclusive.</p> | <p>Ditto ditto, No. 27.</p> |
| <p>No. 412. a. Statement of the Gross and Net Collection of the Tolls, during the past 6 months, from 1st November 1836, to 30th April 1837.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 412. b. Abstract detailing the Expenditure of Collection, &c. ..</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 412 c. Analysis of the Tolls collected in Tolley's Nullah during October 1836.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 413. Letter from Secretary to Military Board, dated 5th May 1837, to Superintendent of Canals, requesting him to furnish the Number and Tonnage of Boats that have passed into the Circular Canal and Tolley's Nullah, since the Fiscal Duties of those Canals have been committed to his control.</p> | <p>Ditto ditto, No. 26.</p> |

Military Board's
Proceedings, 16th
May 1837, No. 28.

- No. 414. Letter from Superintendent of Canals, dated 6th May 1837, to Secretary to Military Board, stating, that he has made no inquiry respecting the lading of Boats that have entered the Canals, but that the number of Boats that entered Tolley's Nullah was 20,030, average burden 305 maunds, and the number that entered the Balliaghatta and Circular Canals was 29,720, average burden of each 150 maunds.
- Ditto ditto, No. 8. No. 415. Letter from Secretary to Government of Bengal, dated 9th May 1837, to the Military Board, in reply to Board's Letter of the 7th ultimo, and its enclosures, approves of the proposal to excavate the Docks at Chingreehatta on the Salt Water Lake, capable of holding Boats of the largest class, but considers a Dock from 150 to 200 Boats quite sufficient; and states, that the Government understands that a part of the site of the proposed Docks is occupied by the Fish Market, in which case a suitable piece of Land for a Market should be provided at the expense of Government.
- Ditto ditto, No. 9. No. 416. Letter from Secretary to Military Board, dated 16th May 1837, to Superintending Engineer, L. P., transmitting the Paper marked No. 415, and requesting him to instruct the Superintendent of Canals, to take measures for carrying the wishes of Government into immediate effect.
- Ditto ditto, No. 29. No. 417. Letter from Military Board, dated 16th May 1837, No. 289, to the Government of Bengal, reporting on the general results of Canal Management, established by the Regulation, dated 1st November 1836.
- Ditto 9th June 1837, No. 10. No. 418. Letter from Secretary to Government of Bengal, dated 30th May 1837, to Military Board, in reply to their Letter of the 16th instant, considers the report of the results of the new system of Canal Management very satisfactory, and which it is desirable should continue, inasmuch as the increase produce of Tolls will serve to cover the expenses for improving the several lines of Navigation, and the works already sanctioned, or which may hereafter appear expedient; a temporary addition of Rupees 150 to the Salary of the Superintendent is allowed, and requests at the end of the year, a further Report.
- Ditto 20th June 1837, No. No. 419. Letter from Secretary to Military Board, dated 9th June 1837, to the Superintending Engineer, L. P., transmitting for his Report, a Petition from certain inhabitants of Intally, requesting the restoration of the Road on the South side of the Intally Canal.
- Ditto ditto, No. 20. No. 420. Letter from Superintending Engineer, L. P., dated 15th June 1837, to Secretary to Military Board, in reply to his Letter

No. 806, of the 9th instant, states, that the Petitioners appear to have no just grounds of complaint against the Superintendent of Canals, for the only houses which have entrances towards the Canal, are those situated within about 800 feet Westward of the Kooleah Bridge, and opposite to these, there is a breadth of from 10 to 15 feet of Road; that when the Intally Canal was cut in 1815, there were Roads left on each side, but parts of which were cut away from time to time to give a greater slope to the Canal Banks.

No. 421. Letter from Secretary to Military Board, dated 20th June 1837, to Superintending Engineer, L. P., stating, that the Board rely on the Superintendent of Canals, for keeping the 800 feet of Road on the South Bank of the Canal, West of the Kooleah Bridge, in a good state.

Military Board's
Proceedings, 20th
June 1837, No. 20.

No. 422. Letter from Superintending Engineer, L. P., dated 29th May 1837, to Secretary to Military Board, transmitting an Annual Report on the Canals by the Superintendent of Canals, marked No. 422. a., and stating, that no arrangements it appears have yet been brought forward respecting the Town Drains; but this can only be effectually done in *conjunction* with the *Conservancy Department* and *Fever Hospital and Municipal Committee*, who he understands have already directed their attention to this important subject, on which it will be useless to speculate until the result of their labour is known, and some definite Plan prepared for Draining the Town, that shall not interfere, as it has hitherto done, with the Navigation of the Circular Canal.

Ditto 23rd June
1837, No. 22.

No. 422. a. Letter from Superintendent of Canals, dated 16th May 1837, to the Superintending Engineer, L. P., reporting generally on the Circular and Balliaghatta Canals and Tolley's Nullah, and stating, that the benefit these Canals would derive by closing the Drains leading into them, would exceed 3,000 Rupees a-year; and as the Governor of Bengal has declared that the Tolls derived from the Canals should be devoted to the improvement of them, it has settled in his mind the expediency of keeping up the Soondurbun line of Navigation; and remarking, that the most favorable months for undertaking excavations in Tolley's Nullah, is April, May, and part of June. . .

Ditto ditto, ditto.

No. 423. Letter from Secretary to Military Board, dated 23rd June 1837, No. 1057, to Superintending Engineer, L. P., in reply to his Letter of the 29th ultimo, states, that the Board can hardly believe that the Superintendent of Canals has seriously contemplated the effects of his proposition for blocking up the mouths of the Calcutta Drains, without devising any other mode of carrying off the Drainage of the Town.

Ditto ditto, No. 24.

Military Board's Proceedings, 23rd June 1837, No. 24.	No. 424. Letter No. 1059, from Military Board, dated 23rd June 1837, to the Governor of Bengal, transmitting, with observations, the Paper marked No. 422. a.
Ditto 27th June 1837, No. 55.	No. 424½. Letter from Superintendent of Canals, dated 4th March 1837, to Superintending Engineer, L. P., transmitting an Original and Revised Bill for repairing the Pucka Road of the Western Bank of the Circular Canal, amounting to Rs. 2,512 : 4 : 9. . .
Ditto 4th July 1837, No. 28.	No. 425. Letter from Superintendent of Canals, dated 14th June 1837, to Secretary to Military Board, relative to the payment of Toll by Boats hired by the Commissariat Department passing through Tolley's Nullah, and stating, the difficulties which arise from Boats being permitted to pass without Tickets under any circumstance.
Ditto ditto, No.	No. 426. Letter from Secretary to Military Board, dated 16th June 1837, to Commissary General, requesting him to state if any objection exists to his giving a Ticket to the Boats employed by the Commissariat passing through the Canals.
Ditto ditto, No. 29.	No. 427. Letter from Commissary General, dated 21st June 1837, to Secretary to Military Board, stating, that the suggestion that Tickets should be furnished to all Fleet Manjees, or Manjees of single Boats employed by the Commissariat, appears to offer the most simple and convenient Plan that can be adopted, and that if the Board concur, he will give the necessary instructions to carry it into effect.
Ditto 18th July 1837, No. 7.	No. 428. Letter from Secretary to the Government of Bengal, dated 11th July 1837, to Military Board, in reply to their Letter No. 1059 of the 23rd June 1837, authorizes the Disbursement of Rupees 800 for digging out the Dhurrumtollah Cess Pool, and of 900 Rupees, for clearing and repairing the Tow-paths along the Soonderbun Canals.
Ditto 21st July 1837, No. 77.	No. 429. Letter from Superintending Engineer, L. P., dated 28th June 1837, to Secretary to Military Board, transmitting the Paper marked No. 429. a. and No. 429, a.(1)
Ditto ditto, ditto.	No. 429. a. Letter from Superintendent of Canals, dated 26th June 1837, to the Superintending Engineer, L. P., transmitting the Paper marked No. 429. a.,(1) and stating, that according to section 2, Regulation I. of 1824, he has taken possession of the Land for the proposed Docks at Balliaghatta, and observes, that it could be shown that the value of the ground is less than 4 annas a biggah per annum, but that the Zemindars will not take less than 1/8 Annas per biggah per annum, as this has been given to them by the Collector of the 24-Per-

gunnahs as Arbitrator, appointed by the Board of Salt and Customs, to settle the value of the ground occupied by the Balliaghatta Salt Works—under the above circumstances, suggests that the Ground required be only rented and not purchased.

- No. 429. a.⁽¹⁾ Letter from the Board of Customs, Salt and Opium, dated 20th June 1837, to the Superintendent of Canals, transmitting Copy of a Letter with its enclosure from the Salt Agent of the 24-Pergunnahs, dated the 6th June last, stating, that the Rent of the Ground occupied by Mr. Prinsep's Salt Works at Balliaghatta, was fixed by Arbitration at 1/8 per Biggah, and that the original award of the Arbitrators it is presumed can be obtained from the Collector of 24-Pergunnahs.

Military Board's
Proceedings, 21st
July 1837, No. 77.

- No. 430. Letter from Secretary to Military Board, dated 21st July 1837, to the Superintending Engineer, L. P., stating, that the Board prefer purchasing to renting the Land required for the Balliaghatta Docks.

- No. 431. Letter from Superintendent of Canals, dated 10th July 1837, to Secretary to Military Board, stating the consequences likely to arise from letting the Circular Canal Lands in the manner directed in his Letter No. 1146, of the 27th June last. ..

Ditto 25th July
1837, No. 29.

- No. 432. Letter from Secretary to Military Board, dated 25th July 1837, to Superintendent of Canals, in reply to his Letter of the 10th instant, states, that the Board do not consider that sufficient grounds exist to render a departure necessary from the Orders sanctioned by Government, and already communicated to him respecting the letting, &c. of the Land on the Bank of the Circular Canal.

Ditto ditto, ditto.

- No. 433. Letter from Military Board, dated 8th August 1837, to the Governor of Bengal, recommending the construction in India, at a cost of 18,200 Rupees of the Iron Vessel, required for the reception of the Steam Machinery of the dismantled Dredging Boat, instead of indenting for it upon the Honorable Court of Directors.

Ditto 8th August
1837, No.

- No. 434. Letter from Superintending Engineer, L. P., dated 8th July 1837, to Secretary to Military Board, transmitting a Bill, amounting to Rupees 3,013 : 6 : 11, for constructing four Toll Houses on the Banks of the Canals.

Ditto 11th August
1837, No. 36.

- No. 435. Letter from Superintendent of Canals, dated 21st July 1837, to Superintending Engineer, L. P., stating, that the only way of ascertaining the price at which the Land required for the Balliaghatta Docks may be obtained, is, by making an offer of the

Ditto ditto, No. 28

highest sum which the Board would recommend the Government to pay, and in case that sum is declined, the price be ascertained by arbitration; that the Land is not worth more than 5 Rupees per Biggah, or Rupees 750 for 150 Biggahs; that Land similar to that required for the Docks is, by the Commissioner of the Soonderbuns, considered of no value, and that nothing was paid for the Land for the Baminghatta Canal. ..

Military Board's
Proceedings, 11th
August 1837, No.
29.

No. 436. Letter from the Superintendent of Canals, dated 3rd August 1837, to the Superintending Engineer, L. P., stating, in explanation of his Letter No. 32, that his Estimate No. 6, of the 16th March 1837, for forming the Balliaghatta Docks is composed of three items,—viz. the purchase of Ground; the construction of a Tide Lock or Sluice; and the excavation of Docks for 400 Boats, amounting in all to Rs. 21,500; but as he was since limited to a sum of 10,000 Rupees to construct the Lock, and make Docks for 150 Boats, he suggested that, as the Ground might cost 4,000 Rupees, and the Lock, Rupees 5,000, the latter should not be constructed till the 1st and 2nd years—but the money remaining, after paying for the Ground, should be expended in excavating the Docks.

Ditto ditto, No.

No. 437. Letter from Secretary to Military Board, dated 11th August 1837, to Superintending Engineer, L. P., requesting him to direct the Superintendent of Canals to offer to the Proprietors of the Land required for the Balliaghatta Docks, the sum of Rupees 2,500.

Ditto 15th August
1837, No. 15.

No. 438. Letter from Superintendent of Canals, dated 24th July 1837, to Secretary to Military Board, stating the probable annual cost of Dredging the Canals.

Ditto ditto, No. 43.

No. 439. Letter from Superintendent of Canals, dated 29th July 1837, to Secretary to Military Board, transmitting a Draft of an Agreement for farming the Circular Canal Land.

Ditto ditto, No. 16.

No. 440. Letter from Secretary to Military Board, dated 15th August 1837, to Superintending Engineer, L. P., transmitting the Paper marked No. 438, and requesting him to direct the Superintendent of Canals to furnish information as to the extent of Dredging that will be required to keep the Canals clean, and the data upon which he founds his calculations.

Ditto 25th August
1837, No. 53.

No. 441. Letter from Secretary to Military Board, dated 30th June 1837, to the Superintendent of Canals, requesting him to furnish a Statement, shewing the average Number and Tonnage of Boats which have passed through the Circular Canal daily, since 1st November 1836, and the greatest number that could be passed, when, from the height of the River, it becomes necessary to keep the Lock Gates closed.

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No. 442. Letter from Superintending Engineer, L. P., dated 14th July 1837, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, for expense incurred in making Tow-paths in the Salt Water Lake, and completing the Bund, cutting Jungle, making Bridges, &c. amounting to Co.'s Rupees 4,410 : 3 : 4. 	Military Board's Proceedings, 25th August 1837, No. 53.
No. 443. Letter from Superintending Engineer, L. P., dated 29th July 1837, to Secretary to Military Board, in reply to his Letter of the 23rd ultimo, No. 1057, relative to the Superintendent of Canals' last Annual Report of the 16th May 1837, transmits, with observations, the Paper marked No. 443, a., and submits an Estimate amounting to Rupees 1,081 : 4 : 0, of the probable expense of clearing out the Dhurumtollah Cess Pool. ..	Ditto ditto, No. 40.
No. 443. a. Letter from Superintendent of Canals, dated 17th July 1837, to Superintending Engineer, L. P., replying to the Military Board's Letter No. 1057, on the subject of the Superintendent's last Annual Report. 	Ditto ditto, ditto.
No. 444. Letter from Secretary to Military Board, dated 25th August 1837, to the Superintending Engineer, L. P., referring to his Letter of the 29th ultimo, requests him to direct the Superintendent of Canals to clean out the Dhurumtollah Cess Pool, and charge the expense of the same in his Bill. 	Ditto ditto, No.
No. 445. Letter from Military Board, dated 25th August 1837, to the Governor of Bengal, transmitting the Bill referred to in the Paper marked No. 442, and recommending that it be passed, and explaining the cause of its excess above the amount of the Estimate (Co.'s Rupees 3,495 : 5 : 4,) sanctioned by the Government on the 19th August, 1835. 	Ditto ditto, ditto.
No. 446. Letter from Secretary to Military Board, dated 25th August 1837, to Superintending Engineer, L. P., in reply to his Letter No. 1636 of the 22nd instant, states, that the Agent of the Proprietors of the Land, required for the Balliaghatta Docks, has accepted Rupees 2,500 for the Land; and that it appears there is no reason for any further discussion on the point. ..	Ditto ditto, No. 13.
No. 447. Letter from Secretary to Government, dated 9th May 1837, to Military Board, transmitting the Paper marked No. 447. a., and calling for a special Report upon the present condition of the Eastern and Circular Canals, with special reference to the points adverted to by the Honorable Court. 	Ditto 29th August 1837, No. 33.
No. 447. a. Despatch, dated 18th January 1837, from the Honorable Court of Directors to the address of the Government of India, respecting the operations on the Eastern and Circular Canals.	Ditto ditto, ditto.

Military Board's Proceedings, 29th August 1837, No. 35.	No. 448. Letter from Superintendent of Canals, dated 8th July 1837, to Officiating Secretary to Military Board, transmitting the Pa- pers marked No. 448, <i>a.</i> to No. 448, <i>e.</i> inclusive, shewing the average Number and Tonnage of Boats which have passed through the Circular Canal, with information relative to the Chitpore Lock Gates, and Cess Pool at the head of the Dhur- rumtollah Drain, &c.
Ditto ditto, ditto.	No. 448. <i>a.</i> Abstract Comparative Statement of the Number of Boats that passed through the Chitpore Lock Gates when they were open and shut.
Ditto ditto, ditto.	No. 448. <i>b.</i> Table shewing the monthly Number of Boats that have pas- sed through the Chitpore Locks, from 1833 to 1837 inclusive.
Ditto ditto, ditto.	No. 448. <i>c.</i> A Return of the Boats which have entered at Dhapah and Chitpore in April 1837, and which have since passed out. ..
Ditto ditto, ditto.	No. 448. <i>d.</i> Register of the opening and shutting of Lock Gates, from 1st of August 1835 to 1st March 1837.
Ditto ditto, ditto.	No. 448. <i>e.</i> Table of the calculated velocities of the Water in the Cir- cular Canal at various heights of the Tide in the River. ..
Ditto ditto, No. 36.	No. 449. Letter from Military Board, dated 29th August 1837, to the Governor of Bengal, in reply to his Letter of the 9th May 1837, marked No. 447, transmits the Papers marked No. 448. and No. 448. <i>a.</i> to No. 448, <i>e.</i> inclusive.
Ditto 5th Septem- ber 1837, No. 67.	No. 450. Letter from Superintending Engineer, L. P., dated 8th July 1837, to the Secretary to the Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 453 : 15 : 6, for digging out the Dhurumtollah Cess Pool, also a Bill for making and repairing the Soondurbun Tow-paths, amounting to Rupees 1,092 : 15 : 6.
Ditto ditto, No.	No. 451. Letter from Military Board, dated 5th September 1837, to the Governor of Bengal, transmitting the first of the two Bills re- ferred to in the Paper marked No. 450, and recommending that it be passed.
Ditto 15th Septem- ber 1837, No. 45.	No. 452. Letter from the Superintendent of Canals, dated 6th September 1837, to Superintending Engineer, L. P., reporting on the state of the Kooleah Bridge, and stating, that it could not be recon- structed on a large scale without injuring the Bazars on both its sides.
Ditto 17th October 1837, No. 66.	No. 453. Letter from Superintending Engineer, L. P., dated 28th August 1837, to Secretary to Military Board, in reply to his Letter of

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- the 15th instant marked No. 440, transmits the Paper marked No. 453. *a.*
- No. 453. *a.* Letter from Superintendent of Canals, dated 24th August 1837, to Superintending Engineer, L. P., replying to Military Board's Letter of the 15th instant, to the address of the Superintending Engineer.
- No. 454. Letter from Secretary to Government of Bengal, dated 26th September 1837, to Military Board, transmitting the Paper marked No. 454, *a.* and requesting a Report thereon.
- No. 454. *a.* Petition from certain Merchants and Traders of Bengal, complaining of the present mode of Collecting Tolls on Tolley's Nullah.
- No. 455. Letter from Secretary to Military Board, dated 3rd October 1837, to Superintendent of Canals, transmitting the Papers marked No. 454, and No. 454, *a.*, and requesting his opinion thereon.
- No. 456. Letter from Superintendent of Canals, dated 16th October 1837, to the Secretary to Military Board, replying to his Letter of the 3rd instant, marked No. 455.
- No. 457. Letter from the Military Board, dated 31st October 1837, to the Deputy Governor of Bengal, replying to Mr. Secretary Mangles' Letter of the 26th ultimo, and transmitting the Paper marked No. 456.
- No. 458. Letter from Superintendent of Canals, dated 11th November 1837, to Secretary to Military Board, transmitting an Authenticated Copy of the Mooktearnamah, granted by the Zemindars having claims on the Salt Water Lakes, to Hurpersaud Bannerjie, to receive Rupees 2,500, the purchase money of 150 Biggahs of Ground bought for the Balliaghatta Docks.
- No. 459. Letter from Superintendent of Canals, dated 11th December 1837, to Secretary to Military Board, transmitting the Papers marked No. 459, *a.* and No. 459, *b.* and stating, that the nett Collections ending 31st October 1837, of the Toll on the Calcutta Canals amount after correction, to Rs. 1,68,150 : 0 : 7.
- No. 459. *a.* Detailed Statement of the expense of collecting the Tolls on the Circular Canal and Tolley's Nullah, from 1st of November 1836 to 1st November 1837.

Military Board's
Proceedings, 17th
October 1837, No.
66,

Ditto 31st October
1837, No. 24,

Ditto ditto, ditto.

Ditto ditto, ditto.

Ditto ditto, No. 25.

Ditto ditto, No.

Ditto 17th Novem-
ber 1837, No. 18.

Ditto 2nd January
1838, No. 9.

Ditto ditto, No. 10.

- Military Board's
Proceedings, 2nd
Jan. 1838, No. 11.
- No. 459. *b.* Annual account current of Toll Collections realised from Circular Canal, &c. and the Disbursements made therefrom during the half year, commencing 1st of November 1836. . . .
- Ditto 16th February 1838, No.
- No. 460. Letter from Military Board, dated 6th February 1838, to the Deputy Governor of Bengal, submitting a Bill by the Superintendent of Canals, amounting to Co.'s Rs. 4,022:7:10, being Rs. 822, in excess of Estimate for cutting down, levelling and repairing the Slopes and Drains of the Balleaghatta Canal, as recommended in Board's Letter, No. 4546, of the 15th December 1835.
- Ditto 2nd March 1838, No. 40.
- No. 461. Letter from Superintending Engineer, L. P., dated 24th January 1838, to the Secretary to Military Board, transmitting a Bill, No. 43, by the Superintendent of Canals, amounting to Rs. 636:9:3, for expense incurred in digging out the Dhurumtollah Cess Pool.
- Ditto 27th March 1838, No. 9.
- No. 462. Letter from Secretary to Government, dated 20th March 1838, to the Military Board, in reply to their Letter No. 6283 of the 13th instant, states, that instructions have been issued to the Accountant General to place at the disposal of the Superintending Engineer, S. W. P. an advance of Co.'s Rs. 2,500, for the purchase of ground for the Balleaghattah Docks.
- Ditto 17th April 1838, No. 62.
- No. 463. Letter from Superintendent of Canals, dated 10th April 1838, to Secretary to Military Board, reporting, that a strong wind on Sunday last, passed across Tolly's Nullah near Paustolah, and the Eastern end of the Balleaghattah Canal, and destroyed in its track all the houses, trees and boats, except the Dhapa Toll-house, which is only partially damaged, and many lives; and that the Navigation of both Canals has been stopped by sunken boats, but that means have been adopted for removing these boats.
- Ditto 1st May 1838, No. 33.
- No. 464. Letter from Superintendent of Canals, dated 19th March 1838, to the Superintending Engineer, S. W. P., in reply to his Letter of the 14th instant relative to Bill No. 31, for repairs made to the Road, Banks and Drains of the Balleaghattah Canal, explains the nature of the work, and the circumstances attending the execution of it.
- No. 465. Letter from Military Board, dated 1st May 1838, to Deputy Governor of Bengal, with reference to Mr. Secretary Halliday's Letter of the 27th February last, requesting a clear explanation of the cause of the Bill referred to in the Paper marked No. 460, exceeding the Estimate, transmits the Paper marked No. 465, and recommends that the Bill be passed.

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No. 466. Letter from Officiating Secretary to Government of Bengal, dated 7th November 1837, to the Military Board, transmitting for report a Petition from Goroodoss Dutt and Deegambur Mookerjee, offering to farm the Tolls of the Circular Canals for the sum of Rupees 1,80,000 per annum, which sum they propose to pay by monthly instalments of Rupees 15,000, and tender Security.	Military Board's Proceedings, 1st May 1838, No. 62.
No. 467. Letter from Superintendent of Canals, dated 8th November 1837, to Secretary to Military Board, stating, that the Collection of Tolls has now been twelve months under his charge, he accordingly reports on the same, and transmits the Paper marked No. 467. a.	Ditto ditto, No. 63.
No. 467. a. Statement of the gross and net Collection of the Tolls on the Canals, from 1st of May to 31st October 1837, by the Superintendent of Canals.	Ditto ditto, No. 64.
No. 468. Letter from Military Board, dated 28th November 1837, to the Deputy Governor of Bengal, with reference to Mr. Secretary Mangles' Letter of the 30th May last, reporting on the general operations of the Toll Collections of the Calcutta Canals for the past year, from 1st November 1836 to 1st November 1837, during which period the new rates and system of Tollage have been enforced, and transmitting the Papers marked No. 467, No. 467, a. and No. 468, a. to No. 468, f.	Ditto ditto, No. 65.
No. 468. a. Statement of the gross Revenue derived from the Canals, from November 1836 to October 1837, amounting to Rupees 1,82,809.	Ditto ditto, No. 66.
No. 468. b. Statement of the expenses attendant on the Toll Collection and Conservancy, amounting to Rupees 7,156 : 6 : 7.	Ditto ditto, ditto.
No. 468. c. Statement of Establishment and Petty Repairs, and Salary of Superintendent of Canals, amounting to Rupees 11,346 : 8 : 10.	Ditto ditto, ditto.
No. 468. d. Statement of expense on account of Dredging, amounting to Rupees 2,863 : 2 : 11½.	Ditto ditto, ditto.
No. 468. e. Statement of Estimates sanctioned during the year 1837, amounting to Rupees 45,739 : 4 : 5.	Ditto ditto, ditto.
No. 468. f. Bills for heavy Annual Repairs, amounting to Rs. 5,620 : 14 : 0.	Ditto ditto, ditto.
No. 469. Letter from the Officiating Secretary to Government of Bengal, dated 19th December 1837, to Military Board, stating, that the Government previously to passing orders on the Board's Report of the 28th ultimo on the general operations of the Toll	Ditto ditto, No. 67.

- Collections on the Calcutta Canals, from 1st November 1836 to 1st November 1837, requests to be furnished with a Statement exhibiting the proportion of the gross Revenue from the Canals which has been realized from empty Boats generally, and the amount collected from empty Firewood Boats generally.
- Military Board's
Proceedings, 1st
May 1838, No.
- No. 470. Letter from Secretary to Military Board, dated 26th December 1837, to Superintendent of Canals, transmitting Copy of the Paper marked No. 469, and requesting him to furnish the information desired in the same.
- Ditto ditto, No. 68. No 471. Letter from Superintendent of Canals, dated 30th December 1837, to Secretary to Military Board, in reply to his Letter of the 26th instant, states, that there are no Returns or Documents in his Office which would enable him to furnish the information required, but hazards an opinion on the subject.
- Ditto ditto, No. 69. No 472. Letter from Military Board, dated 5th January 1838, to the Governor of Bengal, replying to the Letter of the Officiating Secretary to the Government of Bengal, dated 19th December 1837, and transmitting the Paper marked No. 471.
- Ditto ditto, No. 70. No. 473. Letter from Officiating Secretary, to Government of Bengal, dated 24th April 1838, in reply to Board's Letters of 31st October and 28th November 1837, and 5th January 1838, transmits the Papers marked No. 473. *a.* and No. 473. *b.*
- Ditto ditto, No 71. No. 473. *a.* Copy of a Resolution passed by the Deputy Governor of Bengal, on the 24th April 1838, regarding the Tolls levied on the Calcutta Canals, and reducing from 1st May 1838, the Tolls on the same to one-half of their former rate, or 8 annas per 100 maunds.
- Ditto ditto, No. 72. No 473. *b.* Notification, dated 24th April 1838, of the new rates of Toll on the Calcutta Canals, to take effect from 1st May 1838.
- Ditto, 15th May 1838, No. 12. No. 474. Letter from Officiating Secretary to Government of Bengal, dated 17th April 1838, to Military Board, transmitting the Papers marked No. 474. *a.* to No. 474. *f.* inclusive, and requesting them to state, whether a general order for the exemption of Boats laden with Government property from the payment of the Toll leviable on all Boats passing through or into the Canals, specified in Act No. XXII, of 1836, will be productive of any injurious effect upon the Collections, by affording opportunity to the Native Collectors for embezzlement or extortion or otherwise ; that if the measure would be productive of inconvenience, the Board will be pleased to state how the best mode of remitting the Toll might be carried into effect.

(*Extract—Proceedings of the Honorable the Deputy Governor of Bengal, in the General Department, under date 20th March 1838, Comprising the Papers marked No. 474. a. to No. 474. f.*)

PAGE.

Military Board's
Proceedings, 15th
May 1838, No. 13.

- No. 474. a. Letter from Board of Customs, Salt and Opium, dated 23rd March 1838, to Deputy Governor of Bengal, transmitting the Paper marked No. 474. a.(1) &c. and with reference to their Letter of the 26th May 1834, again solicits the remission of the Toll on Boats employed in transporting Salt through the Calcutta Canals to the Sulkea Golahs, as the Superintendent of Canals does not consider himself authorized under the orders of Government in the 4th Paragraph of Mr. Secretary Prinsep's Letter, dated 2nd June 1834, to allow the above Boats to pass free of Impost. Ditto ditto, ditto.
- No. 474. a.(1) Letter from Acting Salt Agent of 24-Pergunnahs, dated 18th July 1837, to the Acting Secretary to the Board of Customs, Salt and Opium, transmitting, with observations, the Papers marked No. 474. a.(1a.) and No. 474. a.(1b.) &c. for the Board's consideration. Ditto ditto, ditto.
- No. 474. a.(1a.) Letter from George Prinsep, Esq., dated 3rd July 1837, to Acting Salt Agent of 24-Pergunnahs, requesting, for the purpose of removing the Salt of the past Season from Balleaghattah to Sulkeah, permission as heretofore, to give Boat Passes under his own signature. Ditto ditto, ditto.
- No. 474. a.(1b.) Letter from Salt Agent of 24-Pergunnahs, dated 3rd July 1837, to Captain J. Thomson, Collector of Canal Tolls, requesting him to order the Officers at the Toll not to detain Boats containing Salt from Mr. Prinsep's Balleaghaut Salt Works in transit to the Sulkea Golahs. Ditto ditto, ditto.
- No. 474. b. Letter from Superintendent of Canals, dated 4th July 1837, to the Salt Agent of 24-Pergunnahs, stating, in reply to his Letter of the 3rd instant, that the Regulations by which he, the Superintendent, is guided, does not allow him any discretion in detaining or permitting to pass free the Boats laden with Government property or otherwise. Ditto ditto, ditto.
- No. 474. c. Extract of a Demi-Official Letter from G. A. Prinsep, Esq., dated 11th July 1837, to the Salt Agent of 24-Pergunnahs, stating that his Boats are waiting at the river mouth of the Canal, and that the business of transporting the Salt in the same is under suspense, and that Captain Thomson has given no orders for their entry. Ditto ditto, ditto.
- No. 474. d. Letter from Salt Agent of 24-Pergunnahs, dated 20th July 1837, to the Superintendent of Canals, with reference to his

Letter of the 4th instant, transmits the Paper marked No. 474. c. and requests him to order Official Passes for the Boats in question, as any accident to them would occasion a heavy loss to Government.

Military Board's Proceedings, 15th May 1838, No. 13. No. 474. e. Letter from Superintendent of Canals, dated 11th July 1837, to the Salt Agent of 24-Pergunnahs, stating that he cannot allow the Boats referred to in his Letter of this day's date, a pass until the regulated Toll is paid.

Ditto ditto, ditto. No. 474. f. Order, dated 28th March 1838, directing, that the Papers marked No. 474. a. to No. 474. e. inclusive, be sent to the Revenue Department, that the necessary instructions may be issued to enable the Board of Customs, Salt and Opium, to convey the Government Salt through the Public Canal, without being subject to Toll, and for the refund of any amount hitherto paid on this account.

Ditto ditto, ditto. No. 475. Letter from Military Board, dated 15th May 1838, to the Deputy Governor of Bengal, in reply to Mr. Officiating Secretary Halliday's Letter of the 17th ultimo, states, that any deviation from the rule under which Toll is at present leviable on Boats in the Canal would, they fear, be productive of extensive abuses, and pointing out a simple method of bringing to account the amount of Toll levied from Government Boats.

Ditto 12th June 1838, No. 33. No. 476. Letter from Superintendent of Canals, dated 14th May 1838, to Secretary to Military Board, transmitting the Papers marked No. 476. a. to No. 476. e. inclusive and reporting on the Toll Collections during the last half year, ending 30th April instant.

Ditto ditto, ditto No. 476. a. Statement of the gross Net Collection of the Tolls on the Canals, from 1st November 1837 to 30th April 1838. ..

Ditto ditto, ditto. No. 476. b. Explanation of the Receipts and Expenditure in the Toll Collection Account, for the half year ending 30th April 1838.

Ditto ditto, ditto. No. 476. c. Amount of current expense Bill in Toll Collection Account, for the half year ending 30th April 1838.

Ditto ditto, ditto. No. 476. d. Comparative Statement of the gross Collections made in the half years, commencing 1st November 1836 and 1837. ..

Ditto ditto, ditto. No. 476. e. Comparative Statement of the Collections made at the different Toll Houses in the half years, commencing 1st November 1836 and 1837.

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No. 477. Letter from Military Board, dated 12th June 1838, to the Deputy Governor of Bengal, transmitting the Paper marked No. 476. No. 476. <i>a.</i> to No. 476. <i>e.</i> inclusive.	Military Board's Proceedings, 12th June 1838, No. 33.
No. 478. Letter from Superintending Engineer, S. W. P., dated 2nd June 1838, to Secretary to Military Board, transmitting the Papers marked No. 478. <i>a.</i> to No. 478. <i>e.</i> relative to the termination of the Town Roads on the Circular Canal, and requesting that the above Papers may be laid before the Military Board, and stating that he thinks the public will suffer less inconvenience by the adoption of Lieutenant Abercrombie's views, than by the cessation of the Town Roads at any point on the Town side of the Bridges.	Ditto ditto, No. 35.
No. 478. <i>a.</i> Letter from Superintending Engineer, S. W. P., dated 23rd May 1838, to Superintendent of Canals, stating, that Lieut. Abercrombie having pointed out that inconvenience is likely to occur from the cessation of the Town Roads at the Marhatta Ditch, he, the Superintending Engineer, requests to know whether he, the Superintendent, is aware of any objection to the management of these Roads being placed under Lieutenant Abercrombie, as far as the standards of the Bridges nearest the Town.	Ditto ditto, No. 36.
No. 478. <i>b.</i> Letter from Superintendent of Canals, dated 25th May 1838, to the Superintending Engineer, S. W. P., in reply to his Letter of the 23rd instant, states, that the Plan proposed by Lieut. Abercrombie would cause expense, without any advantage. ..	Ditto ditto, ditto.
No. 478. <i>c.</i> Letter from Lieutenant Abercrombie, Superintendent of Roads, dated 17th May 1838, to Superintending Engineer, S. W. P., requesting to be informed, what are to be considered the Northern boundaries of the Roads made over to him by the Military Board in their Letter, No. 3097, of 13th October 1837...	Ditto ditto, ditto.
No. 478. <i>d.</i> Letter from Superintending Engineer, S. W. P., dated 30th May 1838, to Superintendent of Roads, Calcutta, in reply to his Letter of the 17th instant, transmits the Paper marked No. 478. <i>b.</i> and requests his observations on the same. ..	Ditto ditto, ditto.
No. 478. <i>e.</i> Letter from Superintendent of Roads, dated 1st June 1838, to Superintending Engineer, S. W. P., replying to his Letter of the 30th ultimo, marked No. 478. <i>d.</i>	Ditto ditto, ditto.
No. 479. Letter from Secretary to Military Board, dated 12th June 1838, to Superintending Engineer, S. W. P., in reply to his Letter of the 2nd instant, states, that the Board concur in his views, and direct the suggestions contained in his Letter under reply, be carried into effect. '	Ditto ditto, ditto.

Military Board's
Proceedings, 15th
June 1838, No. 51.

No. 480. Letter from Officiating Secretary to the Government of Bengal, dated 15th May 1838, to Military Board, transmitting the Paper marked No. 480. *a*, and its enclosures, and requesting that the Board will report, how it occurs that the Canal Land referred to in the above Paper is not under the management of the Superintendent of Canals.

Ditto ditto, No. 52.

No. 480. *a*. Letter from Officiating Secretary to Sudder Board of Revenue, dated 17th April 1838, to Officiating Secretary to Government of Bengal, transmitting with observations, Letters dated 15th March and 4th April 1838, from the Commissioner of Jessore, with enclosures relative to the remuneration of the person employed to collect the Rents from the plots of Ground belonging to Government, which lie along the banks of the Eastern Canal, and requesting the orders of Government on the above, and remarking, that these collections were formerly made by the Darogah or Collector of Tolls on the Canal; but on the management of the Canals being separated from the Office of the Calcutta Collectorate, a Tuhseeldar, in January 1837, was appointed expressly for the purpose of collecting these Rents, and recommending that that Officer be placed with respect to his allowance on the same footing as the Tuhseeldars employed in the Collection of Rents in Calcutta and Punchanogram.

Ditto ditto, No.

No. 481. Letter from Military Board, dated 15th June 1838, to Deputy Governor of Bengal, with reference to the Letter of the Officiating Secretary, Mr. Halliday, of the 15th ultimo, states that the Office Records of the Military Board do not afford the means of replying to the Government inquiries, and stating, that if by the New Canal they are to understand the Circular Canal, they are ignorant of any portion of those Lands being, or ever having been, under the Charge of the Civil Authorities; but if the Lands referred to are those on the sides of the Entally and Balliaghatta Canals, they never were placed under the control of the Canal Committee, or the Military Board, and they are still of opinion, that the Canal Lands would be most advantageously managed by the Superintendent of Canals, were he disposed to undertake that duty in a zealous spirit; in the absence of which, they would recommend the management of the Canal Lands be transferred to the Deputy Collector of Calcutta.

Ditto 26th June
1838, No. 67.

No. 482. Letter from Superintending Engineer, S. W. P., dated 31st May 1838, to Secretary to Military Board, transmitting a Bill by Captain Thomson, No. 57, for making and repairing Towing-paths in the Soonderbund Canals, for the year 1837-1838, also, with observations, the Papers marked No. 482. *a*. and No. 482. *b*.

No. 482. *a.* Letter from Superintending Engineer, S. W. P., dated 21st May 1838, to Superintendent of Canals, requesting him to mention; first, the total length of the Towing-paths on the Soonderbund Canal; second, whether the expense of their repair has been charged in his Bills, for 1834 to 1837 inclusive, and whether the cost for removing Boats and other obstacles from the Canal were included in the above Bills; third, what length the Towing-path, which is referred to in his Letter of the 27th ultimo, is to be made by the Contractor; fourth, what sum he considers sufficient to pay for keeping up Towing-paths and removing obstacles from the Canal in those parts to which his contract with Mr. Storm does not apply; fifth, what arrangements does he propose for seeing that Mr. Storm, or any other Contractor acts up to his engagement, and how he would enforce it if he does not; sixth, why should his, the Superintendent's, Coolies in the Soonderbunds be paid more than those of other people.

No. 482. *b.* Letter from Superintendent of Canals, dated 23rd May 1838, to Superintending Engineer, S. W. P., replying to his Letter of the 21st instant.

Ditto ditto, ditto.

No. 483. Letter from Secretary to Military Board, dated 26th June 1838, to the Superintending Engineer, S. W. P., requesting him, with reference to the question of a Contract with the Agent of the Soondurbun Grantee, for the maintenance and repair of part of the Soondurbun Tracking-path, to direct the Superintendent of Canals to enter into the necessary Contract, and stating that the Board are of opinion that the Government have a right to the Tow-paths along the Soonderbund Line; but if such should prove not to be the case, the necessary steps should be taken, under existing Regulation, to procure it for the use of the Public.

No. 484. Extract—Proceedings of the Honorable the Deputy Governor of Bengal, in the Revenue Department, under date the 3rd July 1838, containing the Resolution passed by the Deputy Governor, directing that the control of the Canal Lands should be placed under the Deputy Collector of Calcutta, instead of being under the management of the Superintendent of Canals.

Ditto 10th July
1838, No. 21.

No. 485. Letter from Secretary to Military Board, dated 10th July 1838, to Superintendent of Canals, transmitting copy of the Paper marked No. 484, and directing the transfer of the Canal Lands, with the Establishment, to the Deputy Collector of Calcutta.

Ditto ditto, No. 22.

No. 486. Letter from Secretary to the Governor of Bengal, dated 10th July 1838, to the Military Board, transmitting the Paper

Ditto, 24th July
1838, No. 14.

marked No. 486. *a*, and requesting, that the necessary order may be issued in accordance with the tenor of the said Paper.

Military Board's
Proceedings, 24th
July 1838, No. 15.

No. 486. *a*. Extract—Proceedings of the Honorable the Deputy Governor of Bengal, in the General Department, under date the 27th June 1838, relative to the Salt belonging to the Government not being a fit object upon which to levy Toll on transit through the Canals, and that the prevention of abuse will be sufficiently assured by the Salt Boats paying Toll according to their Tonnage, and Certificates of such payments being granted to the person in charge of the Boats; these Certificates being checked by the Board of Customs, Salt and Opium, by the deliveries at Sulkeah, &c., and the Board to obtain a refund from the Superintendent of Tolls upon Certificates of the number of maunds of Salt delivered under its order. ..

Ditto ditto, No. 16.

No. 487. Letter from Secretary to Military Board, dated 24th July 1838, to Superintendent of Canals, transmitting for his information, Copy of the Paper marked No. 486. *a*.

Ditto, 31st July
1838, No. 23.

No. 488. Letter from the Deputy Collector of Calcutta, dated 25th July 1838, to Secretary to Military Board, requesting to be furnished with Pottahs, Title Deeds, and other Documents connected with the Canal Lands, lately under the control of Captain Thomson.

Ditto ditto, No. 24.

No. 489. Letter from Secretary to Military Board, dated 31st July 1838, to Deputy Collector of Calcutta, in reply to his Letter of the 25th ultimo, states, that all the records, consisting of Plans, Pottahs, and other Title Deeds relative to the Canal Lands, which are in the Military Board Office, will be made over to Mr. Dampier, the Commissioner of the 18th Division, under instructions received from the Sudder Board of Revenue, on that gentleman sending for the above Documents.

Ditto 21st August
1838, No. 353.
See also Revenue
Department, Pro-
ceeding, 23rd Octo-
ber 1838, Nos. 13,
and 14.—J. M.

No. 490. Letter from Military Board, dated 21st August 1838, to Deputy Governor of Bengal, reporting on the progress made in the construction of the Iron Hull required for the reception of the Steam Machinery of the dismantled Dredging Boat.

Ditto 31st August
1838, No. 49.

No. 491. Letter from Superintendent of Canals, dated 3rd July 1838, to Secretary to Military Board, suggesting the expediency of paying the Toll Darogahs, by a per-centage of 4 per cent. on the amount they collect, and assigns his reasons for the above.

Ditto ditto, ditto.

No. 492. Letter from Secretary to Military Board, dated 20th July 1838, to Superintendent of Canals, in reply to his Letter of the 3rd instant, states, that the Board are willing to adopt his pro-

position—but they request he will explain how he means to pay the Darogahs when the Canals are stopped, and transmitting the Paper marked No. 492. a.

- No. 492. a. Letter from Cosseynauth Nundee, dated 4th July 1838, to the Military Board, bringing to their notice certain Mal-practices carried on to the detriment of Government in the management of the Canal duties, by the Aumlas of Captain Thomson.
 Military Board's Proceedings, 31st August 1838, No. 50.
- No. 493. Letter from Superintendent of Canals, dated 31st July 1838, to Secretary to Military Board, in reply to his Letter of the 20th instant, suggests, that a Commission of 5, instead of 4 per cent. be granted to the Toll Darogahs, as a remuneration for the amount they collect ; and submits further remarks on the conduct and character of that class of Officers.
 Ditto ditto, No. 51.
- No. 494. Letter from Superintendent of Canals, dated 31st July 1838, to Secretary to Military Board, submitting his observations on the Petition of Cossynauth Nundy, respecting the undue-influence exercised by Ramdhone Ghose in the Office of the Superintendent of Canals, and remarking, that the statements made in the Petition shows that the Petitioner is entirely ignorant of what the duties are of the establishment for the Toll Collection and Canal Department, and of the manner in which those duties are executed.
 Ditto ditto, No. 52.
- No. 495. Letter from Secretary to Military Board, dated 17th August 1838, to Superintendent of Canals, in reply to his Letters, No. 69, and No. 70, of the 31st ultimo, states, that the Board do not see sufficient grounds for making any change in the mode of paying the Darogahs ; and requesting, that the indirect connexion of Ramdhone Ghose with the Toll Collection may be dispensed with.
 Ditto ditto, No. 53.
- No. 496. Letter from Superintendent of Canals, dated 23rd August 1838, to Secretary to Military Board, stating, that the interference of Ramdhone Ghose with the Toll Collections may be dispensed with by requiring the Toll Darogahs to nominate some other person to take charge of the money collected, and transmit it to the Treasury.
 Ditto ditto, No. 54.
- No. 497. Letter from Military Board, dated 31st August 1838, to the Deputy Governor of Bengal, transmitting the Papers marked Nos. 491 to No. 496, inclusive, and recommending, that the Toll Collections be transferred direct to the Revenue Authorities.
 Ditto ditto, No. 55.
- No. 498. Letter from Military Board, dated 24th November 1837, to the Deputy Governor of Bengal, submitting the case of Muddenmohun Ghose's encroachment on Government Ground on the
 Ditto 25th September 1838, No. 65.

Banks of the Circular Canal, and requesting instructions on the line of procedure to be pursued, and remarking, that when the powers of a Magistrate were conferred on the Superintendent of Canals, with a view of preserving the Navigation and repressing encroachments on the Banks of the Canal, the Board concluded, that those powers extended to the narrow strips of land on either Bank of the Canal placed under the Superintendent of Canals' charge, under the denomination of the Circular Canal Land ; there however appears to be some doubt as to the power of the Superintendent of Canals, either to correct encroachments, or to Distrain the property of the Tenant for arrears of Rent on Ground belonging to Government.

Military Board's
Proceedings, 25th
September 1838,
No. 66.

No. 499. Letter from Superintendent of Canals, dated 22nd November 1837, to Secretary to Military Board, stating, that the authority given by the Military Board, to collect the Rents of the Land on the Banks of the Circular Canal, also gave authority to Distrain for it, and that he has acted by the advice of the Commissioner, and that he feels justified that his proceedings while in charge of the above Land have been correct, and that he considers that it would be to the advantage of Government to put these Lands under the charge of the Collector of 24-Pergunnahs, who has the power of adjudicating such cases, and issuing a decree to enforce his orders ; that he understands that these Lands have not been registered in the Civil Offices ; and that his proposal some years ago to the Military Board on this subject was, he believes, rejected ; that on his departure from Calcutta, he apprehends all traces of the boundaries will be lost—insects having injured and partly destroyed the original Maps in his possession.

Ditto ditto, No. 68. No. 500. Letter from Secretary to Government of Bengal, dated 2nd January 1838, to Military Board, in reply to their Letters of the 24th November and 12th December last, respecting the case of Muddunmohun Ghose, desires more information on the subject, and to know whether it is expedient, with reference to other like cases, for the Government to maintain its rights before a Civil Tribunal.

Ditto ditto, No. 77. No. 501. Letter from Military Board, dated 9th March 1838, to the Deputy Governor of Bengal, replying to Mr. Officiating Secretary Halliday's Letter of 2nd January 1838, marked No. 500. . .

Ditto ditto, No. 78. No. 502. Letter from Secretary to Government of Bengal, dated 27th March 1838, to Military Board, in reply to their Letter of the 9th instant directs, that measures may be adopted for enforcing the payment of the Rent for that portion of the Land on the sides of the Circular Canal, which has been encroached upon by Muddunmohun Ghose, and requests that an arrange-

ment may be suggested for relieving the Superintendent of Canals, Captain Thomson, from his present charge. . . .

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| <p>No. 503. Letter from Military Board, dated 6th April 1838, to Deputy Governor of Bengal, with reference to the Officiating Secretary Mr. Halliday's Letter of 27th ultimo, recommending that Lieutenant Fagan be directed to assume temporary charge of the Canals and the Toll Collections, and that the salary of the Superintendent be reduced to the former rate of Rupees 600 per mensem. . . .</p> | <p>Military Board's
Proceedings, 25th
September 1838,
No.</p> |
| <p>No. 504. Letter from Officiating Secretary to Government, dated 17th April 1838, to the Military Board, sanctioning the arrangements proposed in their Letter of the 6th instant. . . .</p> | <p>Ditto ditto, No. 79.</p> |
| <p>No. 505. Letter from Officiating Secretary to Government of Bengal, dated 24th April 1838, to Secretary to Military Board, requesting the Board to refrain for the present, from acting on his, the Officiating Secretary's, Letter of the 17th instant. . .</p> | <p>Ditto ditto, No. 80.</p> |
| <p>No. 506. Letter from Superintending Engineer, dated 29th November 1837, to Secretary to Military Board, in reply to his Letter No. 3740, of the 21st November 1837, transmits the Paper marked No. 506. a. . . .</p> | <p>Ditto 23rd October
1838, No. 36.</p> |
| <p>No. 506. a. Letter from Superintendent of Canals, dated 28th November 1837, to Superintending Engineer, L. P., stating, that as the Military Board have acceded to his proposition of damming up the Kamapokurya Khal, a measure which in a great degree defines and limits the quantity of Dredging in Tolly's Nullah, he can now undertake the proposed Dredging operations with every reasonable prospect of success; but which he could not otherwise have calculated on, had the mouth of the Khal been allowed to have remained open. . . .</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 507. Letter from Superintendent of Canals, dated 9th October 1838, to Secretary to Military Board, in reply to his Letter No. 2903, of 5th October 1838, reports on the question, whether the Collection of Tolls cannot be carried on without the intervention of any unpaid and irresponsible individual. . . .</p> | <p>Ditto ditto, No. 35.</p> |
| <p>No. 508. Letter from Military Board, dated 23rd October 1838, to Deputy Governor of Bengal, with reference to Mr. Secretary Halliday's Letter of the 18th September last, transmit the Paper marked No. 507, for his Honor's consideration and orders. . .</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 509. Letter from Superintending Engineer, S. W. P., dated 25th October 1838, to the Secretary to Military Board, stating, that the Superintendent of Canals, reports in his Letter of the 13th in-</p> | <p>Ditto 2nd November
1838, No. 33.</p> |

stant, that the Lock Gates having been open since the rains on the 12th instant, it was found that 1,10,000 cubic feet of mud had been deposited in the Canal by the Narcoldangah Drain. . .

Military Board's
Proceedings, 13th
November 1838,
No. 31.

No. 510. Letter from Superintending Engineer, S. W. P., dated 22nd October 1838, to the Secretary to the Military Board, transmitting the Papers marked No. 510. *a.* and 510. *b.* and stating, that the Balliaghata Docks are capable of holding from 160 to 400 Boats ; that the Docks have been in regular use for more than 2 months, but that they have never been occupied to their full extent.

Ditto ditto, ditto

No. 510. *a.* Letter from Superintendent of Canals, dated 22nd August 1838, to the Superintending Engineer, S. W. P., transmitting a Bill for excavating the Docks at Chingreeghatta on the Salt Water Lakes, and two Plans, shewing the dimensions where the Docks differed from the original design.

Ditto ditto, No.

No. 510. *b.* Letter from Superintendent of Canals, dated 5th September 1838, to Superintending Engineer, S. W. P., transmitting a section through the Balliaghata Docks, and stating, that the length of Bank at which Boats can make fast in the Docks is 8,000 feet, which at 50 feet per Boat, the average space they occupy when lying in their customary manner, is convenient Room for 160 Boats, and in case of necessity, 400 Boats can be accommodated, as there will be no current.

Ditto ditto, No. 34.

No. 511. Letter from Military Board, dated 13th November 1838, to the Deputy Governor of Bengal, transmitting the Bill referred to in the Paper marked No. 510. *a.*, and recommending that it be passed, and stating, that the sum sanctioned by Government for constructing the Docks at Chingreeghatta was limited to Rs. 10,000, and subsequently Rs. 2,500 was granted for the purchase of the ground, making a Total of Rs. 12,500 ; that the Bill referred to above is Rs. 3,072, in excess of the sum sanctioned. . .

Ditto 27th November 1838, No. 38.

No. 512 Letter from Superintending Engineer, S. W. P., dated 13th November 1838, to Secretary to Military Board, transmitting with observations, the Papers marked No. 512. *a.* to No. 512. *c.* inclusive.

Ditto ditto, ditto.

No. 512. *a.* Letter from Superintendent of Canals, dated 28th August 1838, to the Superintending Engineer, S. W. P., stating, that since the excavation of the Balliaghata Docks has been commenced, he has received numerous offers to Rent the intervening Ground ; but as they were made with the apparent intention of monopolizing the advantages of the Docks, he has hitherto declined receiving these offers ; but a Petition signed by a number of respectable people having been addressed to

him to be permitted to build Golahs in the Docks, he considers it is now time to determine how their application may be acceded to.

- No. 512. *b.* Letter from Superintending Engineer, S. E. P., dated 26th October 1838, to Superintendent of Canals, in reply to his Letter of the 25th instant, states, that he is disposed to concur in the expediency of encouraging the erection of Golahs at the Balliaghatta Docks, but thinks that it will be better to send up to the Military Board some distinct proposition relative to the same, with his opinion regarding the effect of acceding to such proposition; on the value of the Docks themselves; on the advantage to accrue to the individual building Golahs; and on the inconvenience or otherwise to the Public at large, that would ensue from transferring to few, the use of Ground which is now common to all.
- Military Board's
Proceedings, 27th
November 1838,
No. 38.
- No. 512. *c.* Letter from Superintendent of Canals, dated 3rd November 1838, to the Superintending Engineer, S. E. P., in reply to his Letter of the 26th ultimo, states, that the renting of the Ground in the Docks will be a proceeding beneficial to the Navigation of the Canal, and that the Fiscal arrangements will be made by the Government; that if the Military Board are of opinion that no Rent is to be levied for storing Goods in the Docks, then the existing Regulation for the Canal is sufficient for the preservation of the Banks and Roads.
- Ditto ditto, ditto.
- No. 513. Letter from Secretary to Military Board, dated 27th November 1838, to Superintending Engineer, S. E. P., in reply to his Letter of the 13th instant, states, that the Board concur in the views taken by him relative to the disposal of the Ground in the Balliaghattah Docks, and requests him to communicate his suggestions to the Superintendent of Canals.
- Ditto ditto, No.
- No. 514. Letter from Superintendent of Canals, dated 19th November 1838, to the Secretary to the Military Board, transmitting the Papers marked No. 514. *a.* to No. 514. *f.* inclusive, and reporting the cause of the results of the Toll Collections being unfavourable under Act No. XXII, of 1836.
- Ditto 18th December 1838, No. 35.
- No. 514. *a.* Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May to 31st October 1838.
- Ditto ditto, ditto.
- No. 514. *b.* Explanation of the Receipt and Expenditure in the Toll Collection Account for the half year, ending 31st October 1838.
- Ditto ditto, ditto.
- No. 514. *c.* Amount of Current Expense Bills in Toll Collection Account for the half year, ending 31st October 1838.
- Ditto ditto, ditto. 

Military Board's Proceedings, 18th December 1838, No. 35.	No. 514. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half year commencing 1st May 1837-38.
Ditto ditto, ditto.	No. 414. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries, made at the different Toll Houses in the half year as above...
Ditto ditto, ditto.	No. 514. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for four Months, ending the 31st October 1837-38.
Ditto ditto, ditto.	No. 515. Letter from Military Board, dated 18th December 1838, to the Deputy Governor of Bengal, transmitting the Papers marked No. 514. <i>a.</i> to No. 514. <i>f.</i> inclusive.
Ditto, 3rd January 1839, No. 41.	No. 516. Letter from Superintendent of Canals, dated 31st December 1838, to Secretary to Military Board, reporting, that he has suspended the Police Jamadar of Tolley's Nullah on account of Mal-practices; and that he fears he shall be obliged to re- move the Jamadar at Balliaghatta on the same account; and that he apprehends that it is almost impossible to carry on the Conservative duties of the Canals satisfactorily with the present establishment of 11 Burkendazes and 2 Jamadars, who have to look after eighteen miles of Navigation; that should the Board think that the late great increase of Canal Revenue warrant their recommending to Government any increase in the Conservative Establishment, he will endeavour to ascertain what number of persons would be required to conduct those duties efficiently.
Ditto ditto, No. 42	No. 517. Letter from Secretary to Military Board, dated 3rd January 1838, to Superintendent of Canals, in reply to his Letter of the 30th ultimo, approves of his removing the Officers of the Toll Department referred to in his Letter, and requests him to report what establishment he considers necessary to enable him to conduct satisfactorily the duties of the Toll Collection, mentioning at the same time the amount of increase of Tolls since he took charge, and the difference between the proposed, present, and former costs of establishment.
Ditto, 8th January 1839, No. 4.	No. 518. Letter from Secretary to Government of Bengal, dated 26th December 1838, to the Military Board, in reply to their Letter of the 16th ultimo, sanctions the expense for the execution of certain works referred to in the Superintendent of Canal's last Annual Report on the Circular and Balliaghatta Canals and Tolley's Nullah.
Ditto ditto, ditto.	No. 519. Letter from Secretary to Military Board, dated 8th January 1839, to Superintending Engineer, S. E. P., acquainting him

with the contents of the Paper marked No. 518, and requesting him to communicate the same to the Superintendent of Canals.

- No. 520. Letter from Superintendent of Canals, dated the 17th December 1838, to Superintending Engineer, S. E. P., in reply to his Letter of the 14th instant, states, that the Entally Canal Road requires large repairs annually at the close of the Rains, in consequence of the great traffic that passes over it, and from the slipping of the bank; and states, that he has no authority to expend money on a contingent work; that the delay of a week for reference and authority would be most injurious on the first appearance of the Bank of the Canal slipping; 150 or 200 Rupees expended immediately, would prevent both the Roads and Canal being made impassable for the season, and the expenditure of 1 or 2,000 Rupees for the repairs.
- Military Board's
Proceedings, 11th
January 1839, No.
40.
- No. 521. Letter from Secretary to Military Board, dated 8th January 1839, to Superintendent of Canals, requesting him to take immediate measures for the removal of two Sunken Boats which the Board are informed are lying in the Lake Channel, and directing his attention to the prevention of such obstacles to safe Navigation.
- Ditto 15th January
1839, No.
- No. 522. Letter from Superintending Engineer, S. E. P., dated 11th January 1839, to Secretary to Military Board, transmitting the Paper marked No. 522. a.
- Ditto ditto, No. 10.
- No. 522. a. Letter from Superintendent of Canals, dated 10th January 1839, to Superintending Engineer, S. E. P., stating, with reference to a Letter received from the Military Board, dated the 10th instant, that it is his custom to remove all Sunken Boats immediately, if it is in his power to do so; and that he has no means of carrying into effect the order of the Board, for the removal of obstructions from the Soonderbun Canals, and assigns his reasons for the same.
- Ditto ditto, No.
10.
- No. 523. Letter from Secretary to Military Board, dated 15th January 1839, to Superintending Engineer, S. E. P., requesting him to instruct the Superintendent of Canals, to remove the Sunken Boats noticed above, without delay; and remarking on the Superintendent of Canal's Letter of the 10th instant.
- Ditto ditto, No. 11.
- No. 524. Letter from Superintending Engineer, S. E. P., dated 11th January 1839, to the Secretary to the Military Board, transmitting a Bill by the Superintendent of Canals, for the construction of a Dam across the mouth of Kowrahpookeria [Kamrapookeria?] Khaul, amounting to Rupees 1,946:14:1, being Rupees 833 less than the Estimate.
- Ditto, 22nd January
1839, No.

- Military Board's
Proceedings, 22nd
January 1839 No.
12.
- No. 525. Letter from Superintendent of Canals, dated 15th January 1839, to Secretary to Military Board, transmitting the Paper marked No. 525, *a.* and stating, that it clearly explains, without the usual exaggeration, a grievance of a serious nature under which a large proportion of those trading at the Balliaghatta and Circular Canals now labour, and have suffered for many years; that he has frequently brought to the notice of the Board the illegal and oppressive conduct of Collinauth Roy, his relations and dependants; that he, the Superintendent, has repeatedly complained against the above individuals to the Magistrate of the 24-Pergunnahs, but has received no redress. . . .
- Ditto ditto, No. 13. No. 525. *a.* Petition of Sonatun Bonerjee, to the Superintendent of Canals, complaining of the oppressive and illegal practices of one Collinath Moonshee, of Tawkey in 24-Pergunnahs, in respect to forcing Boats trading to the Balliaghatta Canal to deposit their goods at his *Aurut*, and taking a Commission on the sale of the Goods. . . .
- Ditto ditto, ditto. No. 526. Letter from Secretary to Military Board, dated 22nd January 1839, to Superintendent of Canals, in reply to his Letter of the 15th instant, requests him to obtain copies of the Proceedings which have been held in the cases to which he refers, in the Court of the Magistrate of the 24-Pergunnahs, when the Board would possibly be justified in submitting the case to Government. . . .
- Ditto, 22nd February 1839, No. 48. No. 527. Letter from Superintendent of Canals, dated 31st January 1839, to Secretary to Military Board, transmitting copy of the Lease granted by him to persons applying for Ground in the Balliaghatta Docks. . . .
- Ditto ditto, ditto. No. 528. Letter from Secretary to Military Board, dated 22nd February 1839, to Captain Thomson, Superintendent of Canals, in reply to his Letter of the 31st ultimo, transmits certain Papers, and requests him, in communication with Lieutenant Boileau, to take them into consideration, and furnish the Board with further information relative to the conditions under which it is proposed to let the Balliaghatta Docks. . . .
- Ditto 26th April 1839. No. 529. Letter from Superintending Engineer, dated 10th April 1839, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, Lieutenant Boileau, for clearing and digging out the Dhurumtollah Cess Pool, amounting to Rs. 484: 3: 0. . . .
- Ditto, 10th May 1839, No. 33. No. 530. Letter from Superintendent of Canals, dated 3rd May 1839, to Secretary to Military Board, reporting, that he has succeeded in proving the gross cases of Fraud on the part of the Toll-

keeper stationed at Dhaphah and Chitpore, and the connivance of the Jamadar stationed at Balliaghattach, and recommending that they be dismissed from their situations.

- No. 531. Letter from Secretary to Military Board, dated 10th May 1839, to Superintendent of Canals, stating, that the Board, considering him competent to pass a decision in such cases as are referred to in his Letter, do not think it necessary to interfere with his dismissing the Officers of the Toll Department mentioned by him.
- Military Board's
Proceedings, 10th
May 1839, No. 33.
- No. 532. Letter from Superintendent of Canals, dated 18th May 1839, to Secretary to Military Board, requesting instructions on the propriety of levying Tolls on Boats entering the Balliaghattach Docks and the Channel leading to Kaleenath Roy's Bazar, and stating his reason for not having hitherto levied such Toll. . .
- Ditto, 31st May
1839, No. 51.
- No. 533. Letter from Secretary to Military Board, dated 31st May 1839, to Superintendent of Canals, in reply to his Letter of the 18th instant, states, that Toll should be taken from all Boats that enter the Channel leading to Collynath's Bazar—but not from those entering the Docks; and requests him to remove the Dhaphah Toll Station from its present position, to the East of Collynath Roy's Channel and of the Docks, by which means he, the Superintendent, would be enabled to levy Toll from all. . .
- Ditto ditto, ditto.
- No. 533½. Petition from the Canal Informers, to the Military Board, dated bringing to the notice of the Board certain abuses in the Calcutta Canals.
- Ditto, 4th June
1839, No. 77.
- No. 534. Letter from Secretary to Military Board, dated 9th April 1839, to Superintendent of Canals, transmitting the Paper marked No. 533½.
- Ditto ditto, ditto.
- No. 535. Letter from Superintendent of Canals, dated 12th April 1839, to Secretary to Military Board, in reply to his Letter of the 9th instant, requests to be furnished with Copies of the former Petitions of the parties referred to in the Paper marked No. 533½.
- Ditto ditto, No. 78.
- No. 536. Petition from Canal Goyendah, or Informer, dated received 16th April 1839, to the Military Board, reporting various Malpractices in the Calcutta Canals.
- Ditto ditto, No. 79.
- No. 537. Letter from Secretary to Military Board, dated 16th April 1839, to the Superintendent of Canals, in reply to his Letter of the 12th instant, transmits 3 Petitions, and states, that all former Petitions to the Board regarding the abuses on the Canals have been generally referred to the Superintendent, in whose Records they should be found.
- Ditto ditto, ditto.

Military Board's Proceedings, 4th June 1839, No. 80.	No. 538. Letter from Superintendent of Canals, dated 23rd April 1839, to Secretary to Military Board, returning the Papers marked No. 536, and promising to furnish a Report relative to the Mal-practices on the Calcutta Canals.
Ditto ditto, No. 81.	No. 539. Letter from Superintendent of Canals, dated 25th April 1839, to Secretary to the Military Board, transmitting the Paper marked No. 539, a. to No. 539, d. inclusive.
Ditto ditto, No. 82.	No. 539. a. Notes by the Superintendent of Canals on the Petition of Cossynath Nundee, to the Military Board, dated the 4th July 1838.
	No. 539. b. The like on the Petition of Sonatun Banoorjea, to Superintendent of Canals, dated January 1839.
	No. 539. c. Ditto on the Correspondence in the Sungbad Sowdamini, Calcutta Newspaper, dated 20th March 1839.
	No. 539. d. Ditto on the Petition of Gobind Goyendah, &c. to the Military Board, dated 9th April 1839.
Ditto ditto, ditto.	No. 540. Letter from Secretary to Military Board, dated 4th June 1839, to Superintendent of Canals, in reply to his Letter of the 25th April last, states, that the Board approve of his proceedings, and request he will continue to prevent speculation and abuse.
Ditto, 11th June 1839, No. 52.	No. 541. Letter from Superintendent of Canals, dated 10th June 1839, to Secretary to Military Board, reporting on the steps he has taken for preventing or detecting any Fraud in the Toll Collections, and the realization of his expectation of the increase of Collections since the appointment of the two new Darogahs. ..
Ditto ditto, ditto.	No. 542. Letter from the Secretary to Military Board, dated 11th June 1839, to Superintendent of Canals, approving of the measures adopted by him for the prevention of speculation and abuse on the Calcutta Canals.
Ditto, 18th June 1839, No. 20.	No. 542½. Letter from Secretary to Government of Bengal, dated 4th June 1839, to Military Board, with reference to Board's Letter of the 23rd October 1839, transmits the Paper marked No. 542½, a.
Ditto ditto, No. 21.	No. 542½. a. Letter from Accountant General, dated 8th May 1839, to Secretary to Government of Bengal, in reply to his Letter of the 29th January last, states, that (he) the Accountant General, concurs with the Military Board in respect to doing away with all unpaid and irresponsible agency in the realization of the Calcutta Toll, and points out the mode in which the Toll Collections should be made over to the General Treasury. ..

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No. 543. Letter from Superintendent of Canals, dated 31st May last, to the Secretary to Military Board, bringing to notice the very great loss sustained in the Toll Collection by the Rule of Measurement for Boats laid down in General Orders of 1st November 1836, which direct the rejecting the fractions of a foot for making the measurement; and stating, that the expense would be trifling of having a set of Tables calculated for general use, in which the Tonnage of any Boat might be ascertained by simple inspection when its dimensions were given.	Military Board's Proceedings, 2nd July 1839, No. 59
No. 544. Letter from Secretary to Military Board, dated the 4th June 1839, to Superintendent of Canals, in reply to his Letter of the 31st ultimo, states, that unless the correct measurement of Boats is likely to make a material difference in the amount of Tolls, the Board would not wish to agitate the matter, as any alteration in the practice now prevailing, would require a revision of Act No. XXII, of 1836.	Ditto ditto, No. 60.
No. 545. Letter from Superintendent of Canals, dated 13th June 1839, to Secretary to Military Board, in reply to his Letter of the 4th instant, transmits the Papers marked No. 545. a. and No. 545. b. exhibiting a loss in the Toll Collection of a quarter of the proper Toll by the present manner of measuring Boats.	Ditto ditto, No. 61.
No. 545. a. Detail Statement of the measurement of Boats at Kidderpore Chokey, entering on the 10th of January 1839, according to the present Regulation, rejecting inches.	Ditto ditto, No. 62.
No. 545. b. The like according to the proposed Regulation, not rejecting inches.	Ditto ditto, No. 63.
No. 545½. Letter from Secretary to Military Board, dated 18th June 1839, to Superintendent of Canals, transmitting copies of the Papers marked No. 542½, and No. 542½, a. for any remarks he may wish to offer, and requesting to know what arrangements he has effected for the deposit of the Toll Collection.	Ditto ditto, No. 22.
No. 546. Letter from Superintendent of Canals, dated 1st July 1839, to Secretary to Military Board, bringing to notice another species of Fraud which he had just discovered in the Toll Department.	Ditto ditto, No. 64.
No. 546½. Letter from Military Board, dated 23rd July 1839, to the Deputy Governor of Bengal, transmitting a revised Estimate, amounting to Rupees 1,220:15:0, by the Superintendent of Canals, for repairing the Puckah Road on the West Bank of the Circular Canal.	Ditto, 23rd July 1839, No. 64.
No. 547. Letter from Superintending Engineer, S. E. P., dated 5th December 1838, to Secretary to Military Board, transmitting the	Ditto, 2nd August 1839, No. 33.

Papers marked No. 547, *a.* to No. 547, *d.* inclusive, relative to increasing the width of the Road on the South side of the Balliaghatta Canal to 20 feet, and of restoring the Slope of the Bank on the same side, and stating, that of the two propositions adverted to by the Superintendent of Canals, that of raising the Road and Sloping the Bank, appearing liable to many objections, and involving the necessity of ultimately purchasing Land, is the only measure which requires consideration.

Military Board's
Proceedings, 2nd
August 1839, No.
34.

No. 547. *a.* Letter from Superintending Engineer, S. E. P., dated 22nd October 1838, to Superintendent of Canals, transmitting a Copy of (his) the Superintending Engineer's Letter to the Secretary to the Military Board of this day's date, and requesting him, the Superintendent, to act upon the 5th and 10th Paragraphs of the above Letter.

Ditto ditto, ditto.

No. 547. *b.* Letter from Superintendent of Canals, dated 3rd November 1838, to Superintending Engineer, S. E. P., in reply to his Letter marked No. 547, *a.* represents the circumstances which prevent his framing an Estimate of the expense of Sloping the South Bank of the Balliaghatta Canal, and of purchasing sufficient Ground to make the Road 20 feet wide.

Ditto ditto, No. 33
and 34.

No. 547. *c.* Letter from Superintending Engineer, S. E. P., dated 20th November 1838, to Superintendent of Canals, with reference to (his) the Superintending Engineer's Letter of the 22nd ultimo, transmits Copy of a Letter from the Assistant Secretary to the Military Board, dated the 16th instant, to (his) the Superintending Engineer's address, and requests, that (he) the Superintendent will act as pointed out by the Military Board, and hopes that he will be able to furnish, for submission to the Board, a scheme, calculated to secure the permanence of the Canal Bank.

Ditto ditto, ditto.

No. 547. *d.* Letter from Superintendent of Canals, dated 1st December 1838, to Superintending Engineer, S. E. P., stating, that previously to replying in detail to the several subjects brought forward in his Letter of the 20th ultimo, he begs to state the circumstances connected with the same, which occurred some years ago.

Ditto ditto, No.

No. 548. Letter from Secretary to Military Board, dated 19th February 1839, to Superintending Engineer, S. E. P., in reply to his Letter of the 5th December 1838, marked No. 547, requests him to direct Lieutenant Boileau to examine and report upon the subject of (his) the Superintending Engineer's above Letter

Ditto ditto, No. 37.

No. 549. Letter from Superintending Engineer, S. E. P., dated the 27th June 1839, to the Secretary to the Military Board, transmitting, with observations, the Paper marked No. 549, *a.*

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No. 549. <i>a.</i> Letter from Superintendent of Canals, Lieutenant A. H. E. Boileau, dated 2nd May 1839, to Superintending Engineer, S. E. P., reporting on the widening of the Road on the South Bank of the Balliaghatta Canal, and the Sloping of the South Bank of the Canal.	Military Board's Proceedings, 2nd August 1839, No. 38.
No. 550. Letter from Secretary to Military Board, dated 2nd August 1839, to the Superintending Engineer, S. E. P., in reply to his Letter of the 27th June last, requests him to direct the Superintendent of Canals to furnish an Estimate for strengthening the South Bank of the Balliaghatta Canal.	Ditto ditto, No.
No. 550½. Letter from Military Board, dated 2nd August 1839, to the Deputy Governor of Bengal, reporting, that no progress has been made in the construction of the Iron Dredging Boat for the Calcutta Canals by the Controller of the Government Steam Vessels, and transmitting correspondence connected therewith, together with Plan and specification for making an Iron Hull to the East Indian Dredging Machinery, and recommending that the Controller should receive positive orders from Government to complete the work without delay, or that the Iron Hull be obtained from England.	Ditto ditto, No. 14.
No. 551. Letter from Superintendent of Canals, dated 7th August 1839, to Superintending Engineer, S. E. P., reporting the Sliding of 255 feet in length of the Bank of the Entallee Canal, midway between the Dhurumtollah Cess Pool and Cooliah Bridge ; and about 60 feet in length of the Bank of the Circular Canal immediately to the Eastward of the Lock at Chitpore, caused by the last heavy rains, and owing to a portion of the Bank having been carried across the site of an old Tank ; and stating, that he has taken measures for remedying the above evil.	Ditto, 13th August 1839, No. 45.
No. 552. Letter from Superintendent of Canals, dated 20th May 1839, to Secretary to Military Board, transmitting the Papers marked No. 552, <i>a.</i> to No. 552, <i>f.</i> inclusive, and reporting on the Toll Collection during the half year, ending 30th April 1839.	Ditto, 16th August 1839, No. 58.
No. 552. <i>a.</i> Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1838 to 30th April 1839.	Ditto ditto, No. 59,
No. 552. <i>b.</i> Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 30th April 1839.	Ditto ditto, ditto.
No. 552. <i>c.</i> Amount of Current Expense Bills in Toll Collection Account for the half year, ending 30th April 1839.	Ditto ditto, ditto.
No. 552. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half year, ending 30th April 1839.	Ditto ditto, ditto.

Military Board's Proceedings, 16th August 1839, No. 59.	No. 552. <i>e.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made at the different Toll Houses in the half year, ending 30th April 1839.
Ditto ditto, ditto.	No. 552. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for 6 months, ending the 30th April 1839.
Ditto ditto, No.	No. 553. Letter from Military Board, dated 16th August 1839, to the Deputy Governor of Bengal, transmitting the Papers marked No. 552, <i>a.</i> to No. 552, <i>f.</i> inclusive, and also the Papers stated in the margin,* and submitting their sentiments on the manner of depositing the Toll Collections in the Public Treasury, and recommending the revision in the Toll Establishment, as well as an alteration in the present mode of measuring Boats, and suggesting certain modifications in Act No. XXII, of 1836, and recommending strongly the farming out the Toll.
* Capt. Boileau's Letter, No. 49, of 31st May 1839.	
Secretary Military Board's Letter, No. 806, of 4th June 1839.	
Captain Boileau's Letter, No. 66, dated 13th June 1839.	
Secretary Military Board's Letter, No. 1313, dated 2d July 1839.	
Military Board's Proceedings, 16th August 1839, No. 60.	No. 554. Letter from Superintendent of Canals, dated 25th June 1839, to Secretary to Military Board, in reply to his Letter of the 18th instant, states the arrangement he has effected for the deposit of the Toll Collection in the Public Treasury; and proposes fixed Salaries to the Toll Darogahs
Ditto ditto, No. 61.	No. 555. Letter from Secretary to Military Board, dated 16th July 1839, to Superintendent of Canals, approving of the arrangement referred to in his Letter of the 25th ultimo, and requesting him to state, what Net Salary should be received by the Darogah when relieved from the maintenance of the Collecting Establishment.
Ditto ditto, No. 62.	No. 556. Letter from Superintendent of Canals, dated 18th July 1839, to the Secretary to the Military Board, in reply to his Letter of the 16th instant, submits with observations a Memo. of the establishment required at each Station, for Collecting Toll. ..
Ditto, 3rd September 1839, No. 11.	No. 557. Letter from Superintendent of Canals, dated 3rd September 1839, to Secretary to Military Board, recommending the immediate removal of the Toll Collector of Pauspotta, as he has been detected of embezzling the Public Money.
Ditto ditto, ditto.	No. 558. Letter from Secretary to Military Board, dated 3rd September 1839, to the Superintendent of Canals, authorizing the removal of the Toll Collector of Pauspotta.
Ditto, 6th September 1839, No. 43.	No. 559. Letter from Superintendent of Canals, dated 4th September 1839, to Secretary to Military Board, recommending certain arrangements in consequence of the dismissal of the Toll Darogah at Pauspotta.

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No. 560. Letter from Superintending Engineer, S. E. P., dated the 27th August 1839, to the Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 409 : 15 : 10, for partially Digging out Sand Banks in Tolley's Nullah.	Military Board's Proceedings, 13th September 1839, No. 46.
No. 561. Letter from Superintending Engineer, S. E. P., dated 27th August 1839, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 497, for repairing the Soonderbun Tow-paths during the season of 1838-39.	Ditto ditto, No. 47
No. 562. Letter from Superintending Engineer, S. E. P., dated 21st August 1839, to Secretary to Military Board, in reply to his Letter of the 22nd February last, transmits the Papers marked No. 562, a. and No. 562, a. ⁽¹⁾ to No. 562, b. ⁽⁶⁾ inclusive, relative to the disposable Grounds at the Balliaghatta Docks. ..	Ditto ditto, No. 49.
No. 562. a. Letter from Superintendent of Canals, dated 2nd March 1839, to Superintending Engineer, S. E. P., stating, that he has endeavoured to obtain farther information respecting the disposable Grounds at the Balliaghatta Docks, the result of which he will communicate hereafter ; and reports, that there appears to be no records whatever of the number of Boats that have entered the Docks since they have been thrown open to the Public ; nor the quantity of Goods that have generally been housed in such temporary Storehouses as have been erected on the lots of Ground already leased out, and that he has made arrangements to remedy the above.	Ditto ditto, No. 50.
No. 562. b. Letter from Superintendent of Canals, dated 16th July 1839, to the Superintending Engineer, S. E. P., transmitting the Paper marked No. 562, b. ⁽¹⁾ to No. 562, b. ⁽⁶⁾ inclusive, and stating, that the whole of the 36 lots within the Docks are now let, but that he thinks that no Ground Rent ought yet to be demanded from the Lease-holders.	Ditto ditto, No. 51.
No. 562. b. ⁽¹⁾ Statement of the daily entrance and exit of Boats into and from the Balliaghatta Dock, for the month of March 1839. ..	Ditto ditto, No. 52.
No. 562. b. ⁽²⁾ The like for April 1839.	Ditto ditto, ditto.
No. 562. b. ⁽³⁾ The like for May 1839.	Ditto ditto, ditto.
No. 562. b. ⁽⁴⁾ The like for June 1839.	Ditto ditto, ditto.
No. 562. b. ⁽⁵⁾ Statement of the lots on which Storehouses have been erected at the Balliaghatta Dock, for the month of March 1839.	Ditto ditto, No. 53.

Military Board's Proceedings, 13th September 1839, No. 53.	No. 562. <i>b.(6)</i> The like for the month of April 1839.
Ditto ditto, No. 54.	No. 563. Letter from Superintending Engineer, S. E. P., dated 21st August 1839, to Secretary to Military Board, transmitting the Estimate marked No. 563, <i>a.</i> and with reference to (his) the Superintending Engineer's Letter of the 22nd ultimo, submits for the consideration of the Board, the result of his observations on certain works at Balliaghatta Docks, proposed in the above Estimate.
Ditto ditto, ditto.	No. 563. <i>a.</i> Estimate, amounting to Rupees 712 : 4 : 9, of the probable expense of levelling the Roads and constructing brick on Edge Drains at the Balliaghatta Docks, dated the 17th December 1838, by Captain Thomson, Superintendent of Canals. . .
Ditto ditto, No.	No. 564. Letter from Secretary to Military Board, dated 13th September 1839, to the Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals to submit Plan and Estimate of the Tunnel Drain, recommended in the 5th Paragraph of the Superintending Engineer's Letter now under reply, and with reference to his communication of the 21st ultimo, states that the matter therein referred to, will be held over for the present.
Ditto, 20th Sep- tember 1839, No.	No. 565. Letter from Superintending Engineer, S. E. P., dated 22nd August 1839, to Secretary to Military Board, in reply to his Letter of the 2nd instant, submits an Estimate by the Superintendent of Canals, amounting to Rupees 1,611 : 4 : 0, for strengthening the South Bank of the Balliaghatta Canal by rough piling.
Ditto ditto, No. 40.	No. 566. Letter from Superintending Engineer, S. E. P., dated 27th August 1839, to Secretary to Military Board, submitting an Estimate by the Superintendent of Canals, amounting to Rupees 8,507 : 13 : 0, for constructing a Pucka Road on the South Bank of the Balliaghatta Canal.
Ditto ditto, No.	No. 567. Letter from Military Board, dated 20th September 1839, to the Deputy Governor of Bengal, with reference to the 3rd and 4th Paragraphs of their Report of the 16th November, and to the 2nd Paragraph of Mr. Secretary Halliday's Letter of the 26th December last, transmit the Estimates referred to in the Papers marked No. 565, and No. 566, and state, that they consider the works noticed in the Estimates highly useful and necessary...
Ditto ditto, No. 15.	No. 568. Letter from Superintendent of Canals, dated 18th September 1839, to Secretary to Military Board, with reference to the Collection of Tolls having during the past year decreased from Rupees 1,71,000 to 71,000, solicits the attention of the Board

to that part of his predecessor's Report, dated the 19th November 1838, which relates to the amount of traffic carried on in Canoes or Boats of less than 25 maunds burden; and states, that many of these Boats are between twenty-five and fifty maunds burden, and that the Revenue is seriously affected by their not being subject to Toll.

No. 569. Letter from Secretary to Military Board, dated 20th September 1839, to Superintendent of Canals, in reply to his Letter of the 18th instant, states, that the Board approves of all his arrangements.

Military Board's
Proceedings, 20th
September 1839,
No. 40.

No. 570. Letter from Secretary to Government of Bengal, dated 19th September 1839, to Military Board, transmitting Copy of a Letter this day addressed to Captain W. R. Fitzgerald, appointing him to Officiate as Superintendent of Canals, &c. during the absence of Captain Boileau.

Ditto, 24th September
1839, No. 9.

No. 571. Letter from Superintendent of Canals, dated 23rd September 1839, to Secretary to Military Board, transmitting the Papers marked No. 571, *a.* and No. 571, *b.*

Ditto, 27th September
1839, No. 15.

No. 571. *a.* Letter from Secretary to Sudder Board of Revenue, dated 11th September 1839, to the Superintendent of Canals, requesting him to report direct to the Sudder Board, on the system of management and check which prevails in the Collection of Tolls under his Superintendence, and to submit a Statement of the Collections for the year 1838-39.

Ditto ditto, ditto.

No. 571. *b.* Letter from Superintendent of Canals, dated 21st September 1839, to Secretary to Sudder Board of Revenue, furnishing the information requested in the Paper marked No. 571, *a.* in respect to detailing the system of management and check, and describing the Northern and Southern lines of Navigation on which Tolls are collected, including the Circular Canal &c., stating the number of Boats passing, and amount of Toll realized during the year 1838-39; and explaining the great decrease in the Collection; the difficulty in preventing embezzlement by the Native Toll Establishment; the efficacy of the means adopted for increasing the Revenue; the reformation effected by discharging all the Old Amlahs; the seizing of Boats without Tickets, &c.; the detailing the present establishment for collecting the Tolls, with remarks on the conservation of the Police Establishment, and explanation of the Toll Tickets issued to Boats; the method of detecting attempts to falsify Tickets; the system of making payments into the Treasury; and the requisites for the prevention of Fraud; the propriety of investigating all complaints; the reasons against farming the

Ditto ditto, ditto.

Tolls ; and the additional trouble it would give to the Superintendent of Canals.

Military Board's
Proceedings, 27th
September 1839,
No. 16.

No. 572. Letter from Secretary to Military Board, dated 27th September 1839, to the Superintendent of Canals, in reply to his Letter of the 23rd instant, states, that a reference having been made to the Sudder Board of Revenue, on the subject of their Secretary's Letter to the address of the Superintendent of Canals, it has been ascertained, that, that Letter or application was entirely an oversight ; but the Military Board approve of (his) the Superintendent of Canals having complied in the present instance with the request of the Sudder Board, but they request in future that he will confine his communications on similar subjects as much as possible to the Office of the Military Board.

Ditto ditto, No. 18. No. 573. Letter from Superintending Engineer, S. E. P., dated 25th September 1839, to Secretary to Military Board, transmitting the Paper marked No. 573, a. and stating with reference to the 3rd Paragraph of the same, that he will, with the Board's approval, request the Superintendent of Canals to furnish an Estimate of the probable expense of reconstructing the Pauspotta Toll House with kutchra and pukka walls, and with as much of the old materials as may be available.

Ditto ditto, No. 19. No. 573. a. Letter from Superintendent of Canals, dated 23rd September 1839, to the Superintending Engineer, S. E. P., reporting, that the Toll House at Pauspotta has been blown down by the late storm, and that some immediate accommodation is required for the Toll Establishment, for which purpose he recommends a second-hand Tent be purchased or large Boat hired, and that the Toll House be rebuilt at a cost of about 500, or 600 Rupees, with kutchra and pukka Masonry, 200 yards Westward of its late position.

Ditto ditto, No. 20. No. 574. Letter from Secretary to Military Board, dated 27th September 1839, to the Superintending Engineer, S. E. P., sanctioning the Superintendent of Canals hiring a Boat for the present accommodation of the Toll Establishment, and requesting an Estimate for the reconstruction of the Pauspotta Toll House. ..

Ditto 4th October 1839, No. 26. No. 575. Letter from Superintending Engineer, S. E. P., dated 30th September 1839, to Secretary to Military Board, transmitting, with observations, the Paper marked No. 575, a.

Ditto ditto, No. 27. No. 575. a. Letter from Superintendent of Canals, dated 26th September 1839, to the Superintending Engineer, S. E. P., reporting, that during the late unusually high Spring Tides, the North Bank

of Tolley's Nullah has received considerable damage in two places; viz. near to the Toll House (West End,) and at the Iron Yard Premises, and recommending that piling and ballast be used to remedy the above injury.

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| <p>No. 576. Letter from Secretary to Military Board, dated 4th October 1839, to Superintending Engineer, S. E. P., authorizing him to do whatever he may consider necessary to repair the injury done to the Banks of Tolley's Nullah, referred to in his Letter of the 30th ultimo.</p> | <p>Military Board's
Proceedings, 4th
October 1839, No.</p> |
| <p>No. 577. Letter from Superintendent of Canals, dated 30th September 1839, to the Superintending Engineer, S. E. P., stating, that the Fences of the 750 Trees on the Banks of the Circular Canal having now been standing for 3 years, the Fences of about 450 of the Trees require to be renewed at a cost of Rupees 200.</p> | <p>Ditto, 8th October
1839, No. 50.</p> |
| <p>No. 578. Letter from Superintendent of Canals, dated 5th October 1839, to Secretary to Military Board, reporting, that he has given over the temporary charge of his Office to Captain Fitzgerald.</p> | <p>Ditto ditto, No.</p> |
| <p>No. 579. Letter from Military Board, dated 8th October 1839, to Superintending Engineer, S. E. P., in reply to his Letter of the 3rd instant, transmitting the Paper marked No. 577, sanctions the expense of renewing the Fences of the Trees on the Banks of the Circular Canal.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 580. Letter from Superintendent of Canals, dated 3rd September 1839, to Secretary to Military Board, transmitting, with observations, the Papers marked No. 580, <i>a.</i> and No. 580, <i>b.</i></p> | <p>Ditto, 11th October
1839, No. 94.</p> |
| <p>No. 580. <i>a.</i> Table shewing the real maundage of each Boat according to the given dimensions, rejecting the surplus inches above quarters of feet.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 580. <i>b.</i> Table shewing the amount of maundage according to the Act No. XXII. of 1836, all broken maundage, short of 25 maunds, being rejected in Boats of less Tonnage than 500 maunds; all broken amounts below 50 maunds being rejected in Boats of from 500 to 1,000 maunds; and all fractions below 100 maunds being omitted in the Tonnage of Boats which exceed 1,000 maunds.</p> | <p>Ditto ditto, ditto.</p> |
| <p>No. 581. Letter from Military Board, dated 10th September 1839, to Deputy Governor of Bengal, in continuation of the 13th and 14th Para. of their Report, dated the 16th ultimo, submit the Papers marked No. 580, and its enclosures, and recommend that 100 Copies of the Table marked No. 580. <i>b.</i>, shewing the</p> | <p>Ditto ditto, No.</p> |

	amount of Toll in Rupees and Annas, and 200 Copies of the Abstract Statement be lithographed.
Military Board's Proceedings, 11th October 1839, No. 104.	No. 582. Letter from Secretary to Government, dated 19th September 1839, to Military Board, in reply to Board's Letter of the 16th ultimo and 10th instant, approves of the several arrangements proposed in regard to the Calcutta Canals.
Ditto ditto, No. 11.	No. 583. Letter from Military Board, dated 11th October 1839, to Superintendent of Canals, with reference to his Letters No. 72, of the 25th June and No. 98, of the 18th July last, states, that the Government has been pleased to sanction the arrangements proposed by him...
Ditto ditto, No. 39.	No. 584. Letter from Superintending Engineer, S. E. P., dated 4th October 1839, to Secretary to Military Board, transmitting the Papers marked No. 584, a. to No. 584, b. inclusive, and recommending that the Road referred to in the Petition be repaired at a Cost not exceeding 200 Rupees; and with reference to the Statement of the Petitioners, that no answer has yet been given to their former Petition, refers to his predecessor's Letter No. 551, of the 22nd June 1838, and its enclosure, by which it will be seen, that the prayer of the Petitioners has been reported upon.
Ditto ditto, ditto.	No. 584. a. Letter from Superintendent of Canals, dated 2nd October 1839, to the Superintending Engineer, S. E. P., transmitting the Papers marked No. 584, a. ⁽¹⁾ and No. 584, a. ⁽²⁾ and No. 584, b. and requesting his orders on the same...
Ditto ditto, ditto.	No. 584. a. ⁽¹⁾ Petition from the owners of Landed Property on the East of the Circular Canal near Mooroollee Mannicktollah, to the Superintendent of Canals, dated transmitting the Paper marked No. 584, a. ⁽²⁾ and stating, that they would even be contented if a passage were made by the side of the Canal to carry off the rain water, which at present is a cause of great inconvenience.
Ditto ditto, ditto.	No. 584. a. ⁽²⁾ Petition from Rajah Radahkanth Deb, and others, dated the 16th April 1838, to the Deputy Governor of Bengal, relative to the repair of the Kutcha Road on the East Bank of the Circular Canal between the Dum-Dum and Mannicktollah Bridges, and the losses and inconvenience to which they have been subjected by the cutting of the Circular Canal, and by the want of a Bridge and Pucka Road.
Ditto ditto, ditto.	No. 584. b. Letter from J. Bedford, Assistant Overseer, dated 2nd October 1839, to the Superintendent of Canals, stating, that about 200 Rupees could be well expended on the Roads and Drains referred to in the Paper marked No. 584, a. ⁽²⁾ , but that owing to

the traffic by Hackeries loaded with bricks, it cannot be expected that the Road will be in good condition during the rains. . .

- No. 585. Letter from Secretary to Military Board, dated 11th October 1839, to the Superintending Engineer, S. E. P., in reply to his Letter of the 4th instant, authorizes the expense required for the repairs of the Road referred to in his Letter at a cost not exceeding Rupees 200.
- Military Board's
Proceedings, 11th
October 1839, No.
- No. 586. Letter from Superintending Engineer, S. E. P., dated 24th September 1839, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 282: 12: 0, for making stone copings to the entrance of the Balliaghatta Dock.
- Ditto 25th October
1839, No. 44.
- No. 587. Letter from Superintendent of Canals, dated 25th October 1839, to Secretary to Military Board, submitting for approval, the Papers marked No. 587, *a*.
- Ditto 15th November 1839, No. 58.
- No. 587. *a*. Draft of a Notification to be published, specifying the alterations to be made in the Act No. XXII. of 1836, in the Measurement of Boats, &c. passing into the Calcutta Canals.
- Ditto ditto, No. 59.
- No. 588. Letter from Superintendent of Canals, dated 15th November 1839, to Secretary to Military Board, in reply to his Letter of the 8th instant, states, that the Ground on the Banks of the Hosenabad Canal is farmed out for 5 years, viz. from 1st May 1837 to 1st May 1842, to Nobinchunder Mittre, at an Annual Rent of Rupees 160, and is regularly paid by Quarterly Instalments, and accounted to Government in the Toll Account.
- Ditto ditto, No. 36.
- No. 589. Letter from Military Board, dated 15th November 1839, to Deputy Governor of Bengal, transmitting the Paper marked No. 587, *a*. and requesting, that the alterations proposed may be carried into effect from the 1st January 1840.
- Ditto ditto, No.
- No. 590. Letter from Captain A. H. E. Boileau, dated 23rd November 1839, to Secretary to Military Board, reporting his return from Sea, and of his having resumed charge of the Office of the Superintendent of Canals from Captain W. R. Fitzgerald.
- Ditto, 29th November 1839, No. 8.
- No. 591. Letter from Secretary to Government of Bengal, dated 3rd December 1839, to Military Board, in reply to their Letter of the 20th September last, sanctions the Superintendent of Canal's Estimate for strengthening the South Bank of the Balliaghatta Canal by rough Piling, and requests further information respecting the construction of a Pucka Road on the South Bank of the above Canal.
- Ditto, 10th December 1839, No. 3.

Military Board's Proceedings, 10th December 1839, No.	No. 592. Letter from Secretary to Military Board, dated 10th December 1839, to Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals, with reference to his Estimate for a Pucka Road on the South Bank of the Balliaghatta Canal, received with (his) the Superintending Engineer's Letter of the 27th August last, to specify the extent of advantage likely to attend the construction of the Road in question.
Ditto, 17th December 1839, No. 7.	No. 593. Letter from Superintendent of Canals, dated 7th December 1839, to Superintending Engineer, S. E. P., requesting permission to replace at a cost of 270 Rupees, 900 Luggowing Posts which are wanting on the Banks of the Balliaghatta, Entallee, and Circular Canals.
Ditto ditto, No.	No. 594. Letter from Secretary to Military Board, dated 17th December 1839, to Superintending Engineer, S. E. P., authorizing him to replace the Luggowing Posts which are wanting on the Banks of the Circular, Eastern, and Balliaghatta Canals, and requesting him to ascertain what would be the cost of substituting Stone Posts for those of Wood.
Ditto, 20th December 1839, No. 23.	No. 595. Letter from Superintendent of Canals, dated 18th December 1839, to Military Board, transmitting the Paper marked No. 595, <i>a.</i> and stating, that he considers that a higher sum may be obtained by publicly advertising the Lease of the Fisheries and Ferries.
Ditto ditto, ditto.	No. 595. <i>a.</i> Form of Notice to be advertised in English and Bengallee for farming Tolley's Nullah and the Circular Canal Fisheries, and the Ferry on Tolley's Nullah.
Ditto ditto, No.	No. 596. Letter from Secretary to Military Board, dated 20th December 1839, to Superintendent of Canals, in reply to his Letter of the 18th instant, authorises him to advertize the Notice proposed by him.
Ditto 14th January 1840, No. 26.	No. 597. Letter from Superintending Engineer, S. E. P., dated 5th January 1840, to Secretary to Military Board, in reply to his Letter of the 17th ultimo, transmits the Papers marked No. 597, <i>a.</i> and No. 597, <i>b.</i>
Ditto ditto, ditto.	No. 597. <i>a.</i> Letter from Superintending Engineer, S. E. P., dated 25th December 1839, to Superintendent of Canals, transmitting a copy of the Military Board's Letter of the 17th instant, and requesting to be furnished with the information noticed in the same; and referring to the Board's suggestion of substituting Stone for Wooden Posts, remarks, that possibly some unserviceable Iron Guns in the Arsenal might be available for the

above purpose, and that it appears to him, that Stone, *i. e.* Chunar Stone, would not only be expensive in its prime cost, but prove unsuitable, from its frangibility, and liability to rapid disintegration by exposure to Salt air.

No. 597. *b.* Letter from Superintendent of Canals, dated 31st December 1839, to Superintending Engineer, S. E. P., in reply to his Letter of the 25th instant, states, that he has inquired at the Arsenal of Fort William, and finds, that there are but few short Carronades in Store as old Iron, and those are not sufficient for the supply of Kentledge to the Marine Department ; that there are nearly a thousand pieces of condemned Iron Ordnance of Native manufacture, of various sizes in the Agra Magazine, which might answer, if brought to Calcutta ; that the price of Stone Posts of the smallest efficient size, about 4 feet long and 3 or 4 inches square, and projecting one foot above the surface of the Ground, would be about 3 Rupees each ; that they would be more durable than Wood, but that they would not compensate for their greater expense ; and states, that 6 feet Wooden Posts will suffice, which will reduce the estimated expense to about one-half.

Military Board's
Proceedings, 11th
January 1840, No.
27.

No. 598. Letter from Secretary to Military Board, dated 14th January 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 5th instant, approves of the instructions given by him to the Superintendent of Canals, relative to the Wooden Posts along the Banks of the Canals.

Ditto ditto, No.

No. 599. Letter from J. A. Dorin, Esq. Accountant Revenue Department, dated 14th December 1839, to Secretary to Military Board, transmitting for the information of the Board, the Papers marked No. 599, *a.* and No. 599, *b.* also Copy of a Letter addressed by him this day to the Superintendent of Canals, marked No. 599. *c.* and with reference to the 2nd Para. of the same, requests, the Board will return to the Superintendent of Canals, after audit, all Bills submitted by him, instead of sending them to the Accountant General for adjustment, to enable the Superintendent to transmit them with his monthly Cash Account, in support of the Charges that may be exhibited therein.

Ditto 17th January
1840, No. 5.

No. 599. *a.* Extract of a Letter from the Accountant General, to the Secretary to the Government of Bengal, dated 8th May 1839, stating, that the Charges of Collection on account of Tolls ought to be in his opinion, to be shewn in the Accounts of the Collector of Tolls, separately rendered by him to the Revenue Accountant, as a set-off against the gross Toll Collections, and requesting permission to instruct the Revenue Accountant to carry the above into effect.

Ditto ditto, No.

- Military Board's
Proceedings, 17th
January 1840, No.
- No. 599. b.** Extract of a Letter from Secretary to the Government of Bengal, to the Accountant General, dated 4th June 1839, approving of the suggestion contained in his Letter of the 8th May 1839.
- Ditto ditto, ditto.
- No. 599. c.** Letter from J. A. Dorin, Esq. Accountant Revenue Department, dated 14th December 1839, to Superintendent of Canals, in continuation of (his) Mr. Dorin's Letters of the 16th and 26th August 1839, states, that the arrangements now sanctioned by Government, has in view the complete separation of (his) the Superintendent's accounts and vouchers, and receipts and expenditure as Superintendent of Tolls, from his accounts and vouchers, and receipts and expenditure, as Agent for Iron Suspension Bridges—the former being adjusted by the Accountant Revenue Department, and the latter by the Accountant General.
- Ditto ditto, No.
- No. 600.** Letter from Secretary to Military Board, dated 17th January 1840, to J. A. Dorin, Esq. Accountant Revenue Department, in reply to his Letter of the 14th December states, that it is quite contrary to the Board's practice to send back passed Bills to Executive Officers, and the Board request to know whether there is any objection to the Bills when passed being sent direct from the Board's Office to him, the Accountant Revenue Department.
- Ditto ditto, No. 7.
- No. 601.** Letter from Superintendent of Canals, dated 26th December 1839, to Superintending Engineer, S. E. P., transmitting Copy of the Paper marked No. 599, c., and its enclosures, and stating, that by the method proposed by Mr. Dorin, the whole amount of Bills in the Canal, Dredging, and Toll Collection Department, will be chargeable to the Tolls by the Accountant Revenue Department, without any alteration or transfer of items, and only those sums expended in the Iron Bridge Department for the *bona fide* construction of Iron Bridges for the Mofussil, or for the repairs of the Iron Yard, Forges, Overseers' Houses, &c. at Allipore, will be debitable to the Civil Building Department, and that he sees no objection in Mr. Dorin's request.
- Ditto 21st January
1840, No. 57.
- No. 602.** Letter from Superintendent of Canals, dated 30th November 1839, to Secretary to Military Board, transmitting the Papers marked No. 602, a. to No. 602, f. inclusive and submitting a Financial Report on the Calcutta Canals, for the year ending 31st October 1839.
- Ditto ditto, No. 58.
- No. 602. a.** Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May to 31st October 1839, the former amounting to Rupees 44,608:11:9, and the latter to Rupees 41,828:10:4.

	PAGE.
No. 602. <i>b.</i> Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 31st October 1839.	Military Board's Proceedings, 21st January 1840, No. 58.
No. 602. <i>c.</i> Current Expense Bill in Toll Collection Account, for the half year, ending 31st October 1839, amounting to Rupees 2,780:1:4.	Ditto ditto, ditto.
No. 602. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half years, commencing 1st May 1839-40.	Ditto ditto, ditto.
No. 602. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries made at the different Toll Houses in the half year, ending 31st October 1839.	Ditto ditto, ditto.
No. 602. <i>f.</i> Comparative Statement of the Number of Boats passing through the Canals, for 6 months, ending 31st October 1839, shewing of large Boats 38,258, and of small 7,609.	Ditto ditto, ditto.
No. 603. Letter from Superintendent of Canals, dated 2nd January 1840, to the Superintending Engineer, S. E. P., reporting, that the Entallee Canal is quite dry at Low Water, and requires to be dug out, which must be done by hand, if the opening of the Cooliah Bridge is too narrow to allow the Hand Dredging Boat to pass through it; this point he will ascertain, should an Estimate be ordered for the above Work.	Ditto ditto, No. 46.
No. 604. Letter from Superintending Engineer, S. E. P. dated 11th January 1840, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 184, for finishing the Dam across the mouth of the Keera-pookria Khall, [? Kamrapookereah] and recommending that it be passed.	Ditto ditto, No.
No. 605. Letter from Military Board, dated 21st January 1840, to the Deputy Governor of Bengal, transmitting with observations, the Papers marked No. 602, and No. 602, <i>a.</i> to No. 602, <i>f.</i> in clusive.	Ditto ditto, No.
No. 606. Letter from Secretary to Military Board, dated 21st January 1840, to Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals, to furnish an Estimate for excavating the Entallee Canal.	Ditto ditto, No.
No. 607. Letter from Superintendent of Canals, dated 25th January 1840, to Secretary to Military Board, reporting the result of the sales by Auction of the expired Leases referred to in his Letter of the 18th ultimo, marked No. 595, exhibiting an increase of Rupees 239:6:0 of Revenue, and recommending that the new	Ditto, 31st January 1840, No. 25.

Lessee of the Balliaghatta Fisheries be permitted to include the waters of the new Docks within his right of Fishery. . .

Military Board's
Proceedings, 31st
January 1840, No.
26,

No. 608. Letter from Secretary to Military Board, dated 31st January 1840, to Superintendent of Canals, approving of the recommendation contained in his Letter of the 25th instant. . . .

Ditto, 11th February 1840, No. 18.

No. 609. Letter from Superintending Engineer, S. E. P., dated 28th January 1840, to the Secretary to the Military Board, transmitting a Letter from the Superintendent of Canals, No. 298, of the 24th instant, mentioning his receipt of a Letter from W. Prinsep, Esq. in which it is stated, that the Tunnel Drain proposed to be constructed at the Docks would prove injurious to the Balliaghatta Salt Works ; and observing, that formerly there was an outlet from the Salt Works direct into the Canal which was closed up by Captain Thomson, who recommended, to prevent injury to the Salt Works, that the indirect mode of communication with the Canal by means of a Tunnel Drain to the Docks should be adopted, but as the Superintendent of the Salt Works is adverse to the Tunnel being executed (he) the Superintending Engineer would therefore recommend that the Estimate sanctioned by Government on the 5th ultimo, for the above work, be cancelled.

Ditto ditto, No. 19.

No. 610. Letter from Secretary to Military Board, dated 11th February 1840, to Superintending Engineer, S. E. P., approving of his suggestion contained in his Letter of the 28th ultimo. . . .

Ditto, 14th February 1840, No. 56.

No. 611. Letter from Superintendent of Canals, dated 4th July 1839, to the Magistrate of the 24-Pergunnahs, reporting, that two Boats had passed the Dhapa Toll Station by force, and were captured after considerable resistance, and made over to six Chowkeydars, who during the night allowed the Boats to be taken away ; and stating, that it is quite useless to make seizures of Boats that are liable to be confiscated under Article 9 of Act No. XXII. of 1836, if the Police Authorities are thus negligent of their charge.

Ditto ditto, ditto.

No. 612. Letter from Magistrate of 24-Pergunnahs, dated 26th August 1839, to the Superintendent of Canals, in reply to his Letter of the 4th ultimo, states, that with every desire to assist in the discharge of his duties by means of (his) the Magistrate's Police, and his readiness to punish any instance of proven delinquency on the part of the Officers of the Police, yet he cannot view their conduct in the instance of which (he) the Superintendent complains, in the culpable light he appears to do, and assigns his reasons for the same.

Ditto ditto, ditto.

No. 613. Letter from the Superintendent of Canals, dated the 13th January 1840, to the Secretary to the Military Board, in reply

to his Letter of the 3rd instant, transmits the Papers marked No. 613. <i>a.</i> to No. 613. <i>c.</i> , and submits a concise Statement of the conservative duties of the Canals, on account of the Establishment required, and a Comparative Statement of Income and Expenditure since he took charge of the Calcutta Canals.			
No. 613. <i>a.</i> Comparative Statement of Establishments.			Military Board's Proceedings, 14th February 1840, No. 56.
No. 613. <i>b.</i> Comparative Statement of Collection.			Ditto ditto, ditto.
No. 613. <i>c.</i> Comparative Statement of Boats.			Ditto ditto, ditto.
No. 614. Letter from Superintending Engineer, S. E. P., dated 16th January 1840, to Secretary to Military Board, with reference to his Letter of the 14th October last, transmits the Papers marked No. 614, <i>a.</i> and No. 614. <i>b.</i>			Ditto ditto, No. 57.
No. 614. <i>a.</i> Letter from Superintendent of Canals, dated 18th December 1839, to the Superintending Engineer, S. E. P., submitting the results of his observations and inquiries respecting the Kamapokhurria Dam, which was built by the late Superintendent of Canals in a very substantial manner between two steep Banks of stiff earth, well protected by ballast on the side opposed to the Flood Tide, and stating, it would be expedient to restore the Dam to its original condition.			Ditto ditto, No. 58.
No. 614. <i>b.</i> Letter from Superintendent of Canals, dated 3rd January 1840, to the Superintending Engineer, S. E. P., submitting a Rough Memorandum, amounting to Rupees 825 : 8 : 7, of the probable cost of putting the Kamapokhurria Dam into an efficient state.			Ditto ditto, No. 59.
No. 615. Letter from Secretary to Government of Bengal, dated the 30th January 1840, to Military Board, stating, that the Deputy Governor is pleased with the favorable results exhibited in their report of the Toll Collection during the half year ending 31st October last, and that he will wait the report which the Board were requested to furnish in regard to the question of farming out the Canal Tolls.			Ditto ditto, No. 6.
No. 616. Letter from Superintendent of Canals, dated 10th February 1840, to Secretary to Military Board, stating, that he has obtained a Decree in his the Superintendent's favor on the Plaint filed by Hurdeb Roy Chowdry against Government, for the purchase money of certain Lands for the Balliaghatta Docks.			Ditto ditto, No. 38.
No. 617. Letter from Superintendent of Canals, dated 12th February 1840, to the Secretary to the Military Board, transmitting			Ditto ditto, No. 60.

	two Sections recently taken across Kamapokhurria Khal and Tolley's Nullah.
Military Board's Proceedings, 13th February 1840, No.	No. 618. Minute by the Chief Magistrate, relative to repairing the Kamapokhurria Dam.
Ditto ditto, No. 61.	No. 619. Letter from the Military Board, dated 14th February 1840, to the Governor of Bengal, transmitting the Papers marked No. 614, to No. 614, <i>a.</i> and No. 614, <i>b.</i> and No. 617, inclusive, and recommending an outlay of Rupees 825, for repairing the Damage sustained by the Kamapokhurria Dam.
Ditto ditto, No.	No. 620. Letter from Secretary to Military Board, dated 14th February 1840, to Superintendent of Canals, in reply to his Letter of the 13th ultimo, states, that the Board are generally unwilling to recommend increase of Establishments, but they will nevertheless forward his proposal to Government with their recommendation, if on further trial to the end of the present half year, he should then consider the proposed increase indispensable.
Ditto, 18th February 1840, No. 65.	No. 621. Letter from Superintendent of Canals, dated 18th January 1840, to Superintending Engineer, S. E. P., submitting an Estimate amounting to Rupees 483 : 14 : 10, including the materials of the old building, by a Native Mistree for reconstructing the Pauspottah Toll House, and recommending that the Estimate be sanctioned.
Ditto ditto, No.	No. 622. Letter from Secretary to Military Board, dated 18th February 1840, to the Superintendent of Canals, sanctioning the Estimate referred to in his Letter of the 18th January 1840, marked No. 621.
Ditto, 6th March 1840, No.	No. 623. Letter from Superintending Engineer, S. E. P., dated 27th January 1840, to Secretary to Military Board, transmitting an Estimate amounting to Rupees 496, by the Superintendent of Canals, for cleaning out the Durrumtollah Cess Pool, and recommending that the Estimate be sanctioned.
Ditto, 10th March 1840, No. 29.	No. 624. Letter from the Accountant Revenue Department, dated 24th January 1840, to the Secretary to the Military Board, in reply to his Letter of the 17th instant, states, that he has no objection to the Board sending to his Office after audit the Bills submitted to them by the Collector of Calcutta Canals, instead of returning them to the Collector.
Ditto, 24th March 1840, No. 62.	No. 625. Letter from Superintending Engineer, S. E. P., dated 27th December 1839, to Secretary to Military Board, transmitting the Paper marked No. 625, <i>a.</i> and stating, that in his opinion

it is unreasonable to expect whilst the Dock Roads and the Road referred to in the above Paper remain in their present condition, that the Docks will be resorted to, and that to induce location and resort, it is necessary to improve the Dock premises by rendering the Roads pukka, and opening a permanent and rapid means of communication with Calcutta; that however he cannot recommend any expenditure beyond that suggested by the Executive Officer, unless the above suggestions be at the same time taken into consideration.

- No. 625. *a.* Letter from Superintendent of Canals, dated 20th December 1839, to Superintending Engineer, S. E. P., stating, that unless the Balliaghatta Docks are more frequented than at present, he does not consider that any advantage would result from the construction of a Pucka Road on the South Bank of the Balliaghatta Canal, and that he would recommend no outlay being incurred at present beyond the trifling repairs required to keep the Cutcha Road passable at all times of the year.

Military Board's
Proceedings, 21th
March 1840, No.
63.

- No. 626. Letter from Secretary to Military Board, dated 24th January 1840, to Superintendent of Canals, with reference to his Letter of the 20th ultimo, to the Superintending Engineer, S. E. P., directs his attention to the inconvenience which was supposed to arise from Boats remaining in the Canals, to obviate which, the Balliaghatta Docks were chiefly constructed; that if the Boats are compelled to enter the Docks, it may then be found necessary to construct the Pucka Road on the South Bank of the Balliaghatta Canal.

Ditto ditto, No.

- No. 627. Letter from Superintendent of Canals, dated 25th January 1840, to Secretary to Military Board, in answer to his Letter of the 24th instant, states, that much inconvenience would result from Boats being permitted to remain for any length of time in the Canals, and stating, that during the 11 months the Canals have been under his charge, the amount of demurrage on Boats has been only $1\frac{3}{10}$ per cent. on the amount of Toll, so that it would seem that the Canal is very little obstructed by Boats remaining beyond the time allowed them; at the same time it ought not however to be concealed from the Board, that during the above period, that out of 71,997 Tickets that have been issued from the 4 Toll Stations, 7,702 Tickets or $10\frac{7}{10}$ per cent. have never been returned to the Office, owing it is reported, to many of these Tickets having been torn up by the connivance of the former Darogahs to avoid payment of the demurrage due upon them; and from a like circumstance as the above, he fears that there is still something wrong at the Dhaphah Station, notwithstanding

Dittoditto, No. 64.

the very great increase of Toll realized at that place, as out of 37,983 Tickets issued from that Station, 5,497, or more than $14\frac{4}{10}$ per cent. are missing; that in order to take away much of the inducement for such fraud; to lessen the inconvenience to Boat Owners, by having their Boats removed either to the Salt Water Lake or to the River; to increase the value of the Ground within the Docks; and to lessen the obstructions to Navigation, he suggests that Boats which have paid Tolls be allowed to remain under certain restrictions, in the Docks without demurrage.

Military Board's
Proceedings, 24th
March 1840, No.
65.

No. 628. Memorandum by the Superintendent of Canals, dated 28th February 1840, submitted to the Military Board, detailing the causes of the Balliaghatta Docks not being more frequently resorted to by Boats; and suggesting certain provisions for relieving the crowded state of the Balliaghatta Canal; also pointing out the necessity for a Pucka Road on the South Bank of the Canal.

Ditto ditto, No. 66.

No. 629. Supplementary Memorandum by the Superintendent of Canals, dated 7th March 1840, submitted to the Military Board, transmitting a Supplementary Statement of Traffic on the South Bank of the Balliaghatta Canal.

Ditto ditto, No.

No. 630. Letter from Secretary to Military Board, dated 24th March 1840, to Superintendent of Canals, with reference to his communication of the 25th January, 28th February, and 7th instant, requests him to publicly notify that Boats are not to pay Toll for the present, for remaining in the Docks, and directs him to report on the effect of this order on the occupation of the Docks, and that in the meantime the Board will postpone the consideration of the proposed Road on the side of the Balliaghatta Canal.

Ditto, 27th March
1840, No. 28.

No. 631. Letter from the Superintending Engineer, S. E. P., dated 9th March 1840, to Secretary to Military Board, transmitting the Paper marked No. 631, a. and with reference to the difficulty of hauling Boats out of the Lock against a strong current, observes, that, that may be overcome by a more simple and less costly manner than that proposed by the Superintendent of Canals, by making the Crews on Board the Boats to haul home upon a rope tied to a stout Post fixed on the shore.

Ditto ditto, No. 29.

No. 631. a. Letter from Superintendent of Canals, dated 29th February 1840, to Superintending Engineer, S. E. P., suggesting an improvement in the present clumsy mode of keeping back the Chitpore Lock Gates in their Cells, and remarking on the danger to which the Gates are exposed by the force of the

Bore, and recommending the construction of a wooden Platform of about 105 feet long and $5\frac{1}{2}$ feet wide, to remedy the difficulty experienced of hauling Boats out of the Lock. . .

- No. 632. Letter from Secretary to Military Board, dated 27th March 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 9th instant, approves of the measures proposed by the Superintendent of Canals, for keeping back in their Cells the Lock Gates at Chitpore, and with reference to the remarks of the Superintending Engineers relative to the construction of wooden Platforms, directs him to carry his suggestion into effect, and if it is not found to answer the end desired, that then the Superintendent of Canals' proposed Platform be again submitted to the Board, with Estimate of expense, &c.

Military Board's
Proceedings, 27th
March 1840, No.

- No. 633. Letter from the Superintending Engineer, S. E. P., dated 22nd March 1840, to the Secretary to the Military Board, transmitting an Estimate by the Superintendent of Canals, amounting to Rupees 4,528 : 10 : 6, of the probable expense of digging the mud out of the Intallee Canal, and recommending that the Estimate be adopted.

Ditto, 31st March
1840, No. 18.

- No. 634. Letter from Secretary to Military Board, dated 30th March 1840, to the Superintendent of Canals, directing him to commence immediately upon cleaning out the Intallee Canal before the Rains make it difficult and expensive, and to defray the expenses of the work from funds in his hands; and stating, that the sanction of Government to the Estimate will be obtained hereafter.

Ditto ditto, No.

- No. 635. Letter from Secretary to Military Board, dated 31st March 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 22nd ultimo, requests him to direct the Superintendent of Canals to furnish a Report as to the circumstances which are supposed to have caused so heavy an Estimate for cleaning out the Entallee Canal, and to state, the rate of Silting since the construction of the Dhurumtollah Cess Pool, as compared with the Silting before the Cess Pool existed.

Ditto ditto, No. 19.

- No. 636. Letter from Military Board, dated 31st March 1840, to the Governor of Bengal, transmitting the Estimate referred to in the Paper marked No. 633, and recommending that it be sanctioned.

Ditto ditto, ditto.

- No. 637. Letter from Superintending Engineer, S. E. P., dated 4th March 1840, to the Secretary to the Military Board, transmitting an Estimate on which is written the approving signature of the Superintendent of Canals, by Luckynarain Mistree of Sibpore, for rebuilding the Pauspottah Toll House, amounting to Co's. Rupees 488 : 14 : 10.

Ditto, 3rd April
1840, No. 43.

Military Board's Proceedings, 3rd April 1840, No. 5.	No. 638. Letter from Superintendent of Canals, dated the 1st April 1840, to Secretary to Military Board, with reference to his Letter of the 30th ultimo, states, that he regrets that there appears to be no chance of his being able to complete even the half of the work of excavating the Intallee Canal before the Rains, and remarks on the causes which prevent it.
Ditto ditto, No. 6	No. 639. Letter from Secretary to Military Board, dated 3rd April 1840, to Superintending Engineer, S. E. P., with reference to the Superintendent of Canals' Letter of the 1st instant, requests him to direct that Officer to pursue such a course as he may under the present circumstances deem most beneficial for the Navigation of the Canal.
Ditto ditto, No.	No. 640. Letter from Military Board, dated 3rd April 1840, to the Governor of Bengal, transmitting the Estimate referred to, in the Paper marked No. 637, and recommending that it to be passed.
Ditto, 21st April 1840, No. 66.	No. 641. Letter from Superintending Engineer, S. E. P., dated 14th April 1840, to the Secretary to the Military Board, transmitting the Paper marked No. 641, <i>a.</i> and stating, that it is so satisfactory, that it needs no remarks from him.
Ditto ditto, No. 67.	No. 641. <i>a.</i> Letter from the Superintendent of Canals, dated the 14th April 1840, to Superintending Engineer, S. E. P., reporting the circumstances which have led to the heavy Estimate of cleaning out the Intallee Canal, and explaining the effect exercised by the Dhurrumtollah Cess Pool in preventing the ingress of Silt into the Intallee Canal.
Ditto ditto, No.	No. 642. Letter from Secretary to the Government of Bengal, dated 14th April 1840, to Military Board, stating, that His Lordship approves of their having authorized the execution of the work charged in the Estimate, transmitted in their Letter of the 31st March last, which Estimate has been passed.
Ditto, 19th May 1840, No. 11.	No. 643. Letter from Superintending Engineer, S. E. P., dated 27th April 1840, to Secretary to Military Board, transmitting the Papers marked No. 643, <i>a.</i> and No. 643, <i>a.</i> ⁽¹⁾ and recommending that the improvement suggested be approved.
Ditto ditto, No. 12.	No. 643. <i>a.</i> Letter from Superintendent of Canals, dated 25th April 1840, to Superintending Engineer, S. E. P., transmitting the Paper marked No. 643, <i>a.</i> ⁽¹⁾ and recommending that the suggestion contained therein be carried into effect.
Ditto ditto, No. 12½.	No. 643. <i>a.</i> ⁽¹⁾ Letter from Mr. M. Crow, dated 14th April 1840, to Superintendent of Canals, pointing out the inconvenient state of the Balliaghattachah Canal Ferry, and the inconvenience which he

No. 644. Letter from Secretary to Military Board, dated 19th May 1840, to the Superintending Engineer, S. E. P., authorizing the execution of the Ghauts referred to in the Paper marked No. 643, *a.*⁽¹⁾ at an expense of not more than Rupees 80. ..

Military Board's
Proceedings, 19th
May 1840, No. 13

No. 645. Letter from Superintendent of Canals, dated 20th May 1840, to
Superintending Engineer, S. E. P., reporting the difficulty he
experiences in visiting the Station of Pauspottah, which lies
three miles East of the Gurriah Hath Bridge, and requesting
to be permitted to expend a sum not exceeding Rupees 80, for
establishing a communication by Land between Gurriah Hath
and Pauspottah Toll Station.

Ditto, 29th May
1840, No. 43

No. 646. Letter from Secretary to Military Board, dated 29th May 1840,
to Superintending Engineer, S. E. P., sanctioning the expense
for establishing the Land communication referred to in the
Paper marked No. 645.

Ditto ditto. No

No. 647. Letter from Superintendent of Canals, dated 8th May 1840, to Secretary to Military Board, transmitting the Papers marked No. 647, *a.* to No. 647, *h.* inclusive, being the usual Financial Returns respecting the Calcutta Canals during the half year, ending 30th April 1840 ; and submitting his observations on the same ; and recommending certain rewards to the Toll Darogahs for the great improvement in the Collection of Toll ; and suggesting the early sanction of Government be obtained for putting the Canal Establishment on a more efficient footing.

Ditto, 12th June
1810. No. 48.

No. 647. a. Statement of Boats paying Tolls during the whole year, ending 30th April 1840.

Ditto ditto, ditto.

No. 647. b. Statement of Missing Tickets.

Ditto ditto, ditto.

No. 647. c. Statement of the Gross and Net Collection of the Tolls on the Canal, from 1st November 1839 to 30th April 1840, the former amounting to Rupees 77,204, and the latter to Rupees 73,731.

Ditto ditto, No. 49.

Military Board's Proceedings, 12th June 1840, No. 49.	No. 647. <i>d.</i> Explanation of the receipts and expenditure in the Toll Collection Account for the half year, ending 30th April 1840. ..
Ditto ditto, ditto.	No. 647. <i>e.</i> Amount of Current Expense Bill and Toll Collection Account for the half year, ending 30th April 1840.
Ditto ditto, ditto.	No. 647. <i>f.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half year, commencing 1st November 1839-40, exhibiting an increase of Rupees 42,440.
Ditto ditto, ditto.	No. 647. <i>g.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries made in the different Toll Houses in the half year, ending 30th April 1840.
Ditto ditto, ditto.	No. 647. <i>h.</i> Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 30th April 1840, amounting to 58,673 of Boats paying Tolls, and 9,824 small Boats. ..
Ditto ditto, No.	No. 648. Letter from Military Board, dated 12th June 1840, to the Governor of Bengal, transmitting the Papers marked No. 647, and its enclosures, and stating, that they are ready to accede to every request made by the Superintendent of Canals in the above communication.
Ditto, 16th June 1840, No. 11.	No. 649. Letter from Secretary to Government, dated 2nd June 1840, to Military Board, transmitting for their information, the Papers marked No. 649, <i>a.</i> to No. 649, <i>b.</i> inclusive.
Ditto ditto, No. 12.	No. 649. <i>a.</i> Letter from J. P. Grant, Esq. Accountant Revenue Department, dated 19th May 1840, to Secretary to Government of Bengal, transmitting with observation, the Papers marked No. 649, <i>a.</i> ⁽¹⁾ to No. 649, <i>b.</i> inclusive regarding the Cash Accounts of the Superintendent of Canals and the Collector of Tolls, for the order of the Right Honorable the Governor of Bengal. ..
Ditto ditto, ditto.	No. 649. <i>a.</i> ⁽¹⁾ Extract of a Letter from the Revenue Accountant, to the Collector of Tolls, requesting to be informed, whether the balance and petty Account for Fines credited to profit and loss in his Cash Account for February, exhibits the whole of the realizations of Fines levied in that month, or only such portion thereof, as remain after deducting any extraordinary disbursements made from it, as the credit entry would imply. ..
Ditto ditto, ditto.	No. 649. <i>a.</i> ⁽²⁾ Letter from Superintendent of Canals, dated 16th May 1840, to J. P. Grant, Esq. Revenue Accountant, in reply to his Letter of the 13th instant, transmits the Paper marked No. 649, <i>a.</i> ⁽³⁾ and states, that his Cash Accounts do not include the whole amount realized by Fines, but only the balance remaining, after deducting extraordinary disbursements made

from it ; that as he never receives any Salary as Collector of Toll, nor is provided with a sufficient Establishment for the business of his Department, he hopes that it will not be found necessary for him to furnish monthly details of Petty Accounts, but that only the Balance, if any, may be credited to Government according to the present practice... ..

- No. 649. *a.*⁽³⁾ Statement of the Petty Account for Fines, &c. for the month of February 1840, amounting to Rupees 117 : 6 : 0. Military Board's Proceedings, 16th June 1840, No. 12.
- No. 649. *b.* Letter from Deputy Secretary to the Government of Bengal, dated the 2nd June 1840, to J. P. Grant, Esq. Revenue Accountant, in reply to his Letter of the 19th ultimo, relative to embodying in the monthly Cash Accounts of the Superintendent of Canals, and Collector of Tolls, the gross amount of Fines collected and disbursed by that Officer, instead of bringing the Net Balance only to credit, states, that the Governor of Bengal entirely concurs in (his) Mr. Grant's opinion, and is pleased to sanction the Plan recommended by him for adoption. Ditto ditto, ditto
- No. 650. Letter from Secretary to Military Board, dated 16th June 1840, to the Superintendent of Canals, transmitting the Paper marked No. 649, and requesting him to insert in his monthly Cash Accounts of Toll Collections, the gross amount of Fines collected, and the amount of Pay to Informers. Ditto ditto, No. 13.
- No. 651. Petition of Cossynauth Paul, resident of Balliaghatta, dated 5th June 1840, to Military Board, stating, that there are Mal-practices carried on by the Toll Darogahs of the Circular Canal at Dhaphah and at Cossypore, and offers his services in exposing the tricks practised in the Collection of Tolls. Ditto, 26th June 1840, No. 35.
- No. 652. Letter from Secretary to Military Board, dated 16th June 1840, to Superintendent of Canals, transmitting the Paper marked No. 651, and requesting a Report thereon. Ditto ditto, No. 36.
- No. 653. Letter from Superintending Engineer, S. E. P., dated 16th June 1840, to Secretary to Military Board, transmitting the Papers marked No. 653, *a.* to No. 653, *f.* inclusive and recommending that they be passed. Ditto, 30th June 1840, No.
- No. 653. *a.* Bill No. 1, by the Superintendent of Canals, amounting to Rupees 436 : 0 : 3, for expense incurred in clearing out the Dhurruntollah Cess Pool. Ditto ditto, ditto.
- No. 653. *b.* Bill No. 2, by ditto, amounting to Rupees 196 : 12 : 2½, for expense incurred in renewing the Fences for the protection of young trees planted along the Circular Canal. Ditto ditto, ditto.

Military Board's Proceedings, 30th June 1840, No.	No. 653. <i>c.</i> Bill No. 3, by ditto, amounting to Rupees 192 : 14 : 0, for expense incurred in repairing the Kutcha Road on the East Bank of the Circular Canal in the vicinity of Manicktollah. ..
Ditto ditto, ditto.	No. 653. <i>d.</i> Bill No. 4, by ditto, amounting to Rupees 1,204 : 7 : 0, for repairing the Pucka Road on the West Bank of the Circular Canal, between the Balliaghatta and Narcoledangah Bridges, amounting to Rupees 1,204 : 7 : 0.
Ditto ditto, ditto.	No. 653. <i>e.</i> Bill No. 5, ditto, amounting to Rupees 64 : 11 : 3, for mooring Posts along the Banks of the Balliaghatta and Circular Canals, for Boats.
Ditto ditto, ditto.	No. 653. <i>f.</i> Bill No. 6, by ditto, amounting to Rupees 370 : 5 : 6, for strengthening the Proving Machine.
Ditto ditto, No. 74.	No. 654. Letter from Superintending Engineer, S. E. P., dated 16th June 1840, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 229 : 10 : 3, for repairing the Roadway of the Manicktollah Bridge with a brick on edge metalling, and stating, that it remains to be seen what the effect will be of oft recurring Vibrations on the two portions of the metalling of the Road on the Bridge, prepared respectively with and without cement.
Ditto ditto, No. 32.	No. 654½. Letter from J. L. Heatly, Esq. a Government Grantee, dated 24th June 1840, to Superintendent of Canals, requesting permission to take a Copy of the Map of the Eastern Canals by Captain Thomson, as it will prove very serviceable in forming a correct judgement of the capabilities of the Grounds for the improvements which he proposes.
Ditto ditto, No.	No. 655. Letter from Secretary to Military Board, dated 30th June 1840, to Superintending Engineer, S. E. P., stating, that the Board have no objection to the Superintendent of Canal's allowing Mr. Heatly to take a Copy of the Map he requires.
Ditto ditto, ditto.	No. 656. Letter from Secretary to Military Board, dated 30th June 1840, to Superintending Engineer, S. E. P., stating, that the Bills transmitted in his Letter of the 16th instant, have this day been passed by the Board.
Ditto, 3rd July 1840, No. 47.	No. 657. Letter from Superintending Engineer, S. E. P., dated 25th June 1840, to Secretary to Military Board, transmitting a Letter from the Superintendent of Canals, stating, that at the present season the inquiries regarding the proposition of Mr. Heatly for improving the Navigation of certain portions of the Canal communication cannot be prosecuted.

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No. 658. Letter from Deputy Secretary to Government of Bengal, dated 14th July 1840, to Military Board, in reply to their Letter of the 12th ultimo, considers the results which the Toll Accounts for the last half year, exhibit as satisfactory, and sanctions the additional Establishment recommended by the Board. ..	Military Board's Proceedings, 4th August 1840, No. 2.
No. 659. Letter from Superintending Engineer, S. E. P., dated 30th July 1840, to Secretary to Military Board, transmitting a Bill by the Superintendent of Canals, amounting to Rupees 109 : 13 : 4, for constructing Cranes for the Log Dam at Chitpore... ..	Ditto, 11th August 1840, No.
No. 660. Letter from Secretary to Military Board, dated 17th July 1840, to Superintending Engineer, S. E. P., requesting him to direct the Superintendent of Canals and Agent for Iron Suspension Bridges, to report for the Board's information, the nature and result of all trials of the strength of Bars used in the construction of Bridges under his Superintendence.	Ditto, 14th August 1840, No. 54.
No. 661. Letter from Superintending Engineer, S. E. P., dated 28th July 1840, to Secretary to Military Board, in reply to his Letter of the 17th instant, transmits with observations, the Paper marked No. 661. a.	Ditto ditto, No. 55
No. 661. a. Letter from Agent for Iron Suspension Bridges, dated 25th July 1840, to Superintending Engineer, S. E. P., reporting upon the nature and result of all trials of the strength of Iron Bars, used in the construction of Bridges under his Superintendence, with his remarks thereon.	Ditto ditto, No. 56.
No. 662. Letter from Secretary to Military Board, dated 14th August 1840, to the Superintending Engineer, S. E. P., with reference to his Letter of the 28th ultimo, and its enclosure, states that the Report by the Agent of Iron Suspension Bridges is very satisfactory, and sanctions that officer, with the view of making the Proving Machine more perfect, to indent upon the Superintendent of Mathematical Instrument-maker's Establishment, for a pair of brass sliding Gauges of the description required.	Ditto ditto, No.
No. 663. Letter from Superintending Engineer, S. E. P., dated 17th July 1840, to Secretary to Military Board, with reference to his Letter of the 19th ultimo, directing, that the Barrackpore Bridge should be kept in good repair, but that no expense should be incurred in substituting a broad Roadway for the two narrow ones, transmits the Paper marked No. 663, a. and observes, that the practice of laying a Stratum of Khoah over the Platforms of Suspension Bridges, without any provision for Drainage, must prove ruinous to the under wood-work.	Ditto ditto, No. 63

Military Board's
Proceedings, 14th
August 1840, No.
64.

- No. 664. Letter from Superintendent of Canals, dated 16th July 1840, to Superintending Engineer, S. E. P., reporting, that the rough Estimate for renewing the wood-work of the Suspension Bridge over the Circular Canal, on the Road leading to Barrackpore, would amount to Rupees 2,788, exclusive of Rupees 165, for raising the floor two feet, and recommending, that his Estimate, forwarded in his Letter of the 12th July 1839, for thoroughly repairing the Bridge, be adopted.
- Ditto ditto, No. 65. No. 665. Letter from Secretary to Military Board, dated 14th August 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 17th ultimo, requests him to forward the Estimate by the Superintendent of Canals, for repairing the Suspension Bridge on the Road to Barrackpore, and states, that the Board before recommending the expense of doing away with the foot-path over the above Bridge, and making a broad Roadway, desire further information on the subject.
- Ditto ditto, No. 66. No. 666. Letter from Superintending Engineer, S. E. P., dated 28th July 1840, to Secretary to Military Board, transmitting the Paper marked No. 666, *a*.
- Ditto ditto, ditto. No. 666. *a*. Estimate by the Superintendent of Canals, amounting to Rupees 5,103: 9: 8, for repairing the Bridge over the Circular Canal on the Road to Barrackpore.
- Ditto ditto, No. 67. No. 667. Letter from Superintending Engineer, S. E. P., dated 1st August 1840, to Secretary to Military Board, transmitting the Paper marked No. 667, *a*. and stating, that the foot-path over the Bridge referred to, can hardly in this country be deemed either an advantage or otherwise; but thinks the most advisable proceeding would be, to await the submission of the proposal for improving the Navigation of the Canal by the construction of another pair of Gates under the Bridge in question, in order that the two propositions may be considered together, and that in the meantime, the unsound Planking can be replaced at a cost not exceeding Rupees 450.
- Ditto ditto, No. 68. No. 667. *a*. Letter from Superintendent of Canals, dated 31st July 1840, to Superintending Engineer, S. E. P., explaining the advantages to be derived from substituting a broad Roadway in place of the two narrow ones at the Bridge over the Circular Canal on the Road to Barrackpore, but that as the Military Board, and the Superintending Engineer, do not think the proposed alteration of the Bridge an improvement which would compensate for any large outlay, he has no desire to urge the adoption of his Estimate, as he purposes submitting a proposal for improving the Navigation of the Circular Canal, and the building of another pair of Gates under the Barrack-

pore Bridge, to lessen the risk of inundation from hurting of the Chitpore Lock Gates; that the repairs of the Planking, could, for the present, be made, so as to make the Bridge safe for three or two seasons longer, for a sum not exceeding 450 Rupees.

- No. 668. Letter from Secretary to Military Board, dated 14th August 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 10th instant, sanction for the present the outlay of Rupees 450, for repairing the Planking of the Bridge over the Circular Canal on the Road to Barrackpore.
 Military Board's Proceedings, 14th August 1840, No.
- No. 669. Letter from Superintendent of Canals, dated 18th August 1840, to Superintending Engineer, S. E. P., requesting permission to build huts to be erected on the Canal Banks at intervals of three or two miles, for the accommodation of the seven Burken-dazes added to the present Canal Establishment of 11 Men.
 Ditto, 25th August 1840, No. 27.
- No. 670. Letter from Superintending Engineer, S. E. P., dated 31st August 1840, to Secretary to Military Board, transmitting the Paper marked No. 670, *a.* and stating, that he has directed the Superintendent of Canals, to secure the Bank of Tolley's Nullah in the manner suggested by him, and to furnish an approximate Estimate of the cost.
 Ditto, 1st September 1840, No. 24.
- No. 670. *a.* Letter from Superintendent of Canals, dated 28th August 1840, to Superintending Engineer, S. E. P., reporting, that the late heavy Floods have cut away the Banks of Tolley's Nullah on both sides of the North Abutment of the Iron Suspension Bridge at Gurraah Hath, and that it is essential to repair the damages by means of Piles as early as possible.
 Ditto ditto, No. 65.
- No. 671. Letter from Superintending Engineer, S. E. P., dated 20th August 1840, to Secretary to Military Board, transmitting the Paper marked No. 671, *a.* and with reference to the Road, therein referred to, recommends that it may be made only 15 feet in breadth, which would only cost Rupees 2,625, for the required distance of 3,444 feet.
 Ditto, 4th September 1840, No. 27.
- No. 671. *a.* Letter from Superintendent of Canals, dated 19th August 1840, to Superintending Engineer, S. E. P., transmitting the Paper marked No. 671, *b.*, and with reference to the same, states, that he himself has experienced so much inconvenience from the deep mud on the Road on the North Bank of the Balliaghatta Canal, that he would beg to recommend something be done to render the Road passable during the Rains, at least as far as the Pucka Cross Road, which joins the Great Balliaghatta Road to the Canal a few hundred yards Eastward of the Ferry, and remarking, that the cost of making Pucka of

nearly $\frac{1}{2}$ of a mile of Road, 20 feet wide, instead of 24 feet, as stated in the Petition, would be nearly 3,500 Rupees. ..

Military Board's
Proceedings, 4th
September 1840,
No. 28.

No. 671. *b.* Petition, dated 12th Srabun, 1247, or August 1840, from certain Merchants at Culliah Gunge, Balliahghatta, complaining of the bad state of the Kutcha Road on the North Bank of the Balliahghatta Canal, and praying, that the Road may be made Pucka to a distance of 3,444 feet, and 24 feet in width, and stating, that originally there existed a Pucka Road made at an expense of nearly 1,000 Rupees by the Widow of the late Baboo Rajchunder Doss, but in the year 1838, it was destroyed by the Superintendent of Canals, to allow the Sloping of the Bank of the Canal.

Ditto, ditto, No.

No. 672. Letter from Military Board, dated 4th September 1840, to the Government of Bengal, transmitting the Paper marked No. 671, *a.* and No. 671, *b.* and recommending the construction of a Pucka Road on a certain portion of the North Bank of the Balliahghatta Canal, at an expense of Rupees 3,500.

Ditto, 18th Sep-
tember 1840, No.
27.

No. 673. Letter from Superintendent of Canals, dated 12th September 1840, to Superintending Engineer, S. E. P., reporting, that nearly 40 slides have lately taken place in the Banks of the Balliahghatta and Entally Canals, measuring about 520 yards, which he recommends be repaired at an expense of 15 Annas per running yard, or Rupees 487 : 8 : 0 in all.

Ditto ditto, No. 28.

No. 674. Letter from Secretary to Military Board, dated 18th September 1840, to Superintending Engineer, S. E. P., sanctioning the repairs of the Banks of the Balliahghatta and Entally Canals.

Ditto, 22nd Sep-
tember 1840, No.
57.

No. 675. Letter from Superintending Engineer, S. E. P., dated 9th September 1840, to Secretary to Military Board, transmitting the Paper marked No. 675, *a.*

Ditto ditto, No. 58.

No. 675. *a.* Letter from Superintendent of Canals, dated 3rd September 1840, to Superintending Engineer, S. E. P., with reference to Mr. John Scott Russell's method of preventing injury to Iron Suspension Bridges, and other flexible structures, by the vibration or undulation to which they are occasionally exposed by the action of Storms and other causes—observes, that he does not think it necessary to apply Stays to Suspension Bridges of less span than 150 feet, and that he has never observed any dangerous undulation in the Kalleeghaut Bridge, which is 141 feet long, nor in Hastings' Bridge, the central opening of which is 176 feet.

Ditto ditto, No. 6.

No. 676. Letter from Deputy Secretary to the Government of Bengal, dated 15th September 1840, to Military Board, sanctioning

the construction of the Road referred to in their Letter of the 4th instant.	
No. 677. Letter from Superintendent of Canals, dated 24th September 1840, to the Officiating Superintending Engineer, reporting for the information of the Military Board, that the principal Slides which have taken place in the Intallee and Balliaghatta Canals, are not on that portion of the Bank for which Piling was sanctioned by Government on the 3rd December last.	Military Board's Proceedings, 29th September 1840, No. 48.
No. 678. Letter from Superintending Engineer, S. E. P., dated 13th October 1840, to the Secretary to the Military Board, transmitting an Estimate by the Superintendent of Canals, amounting to Rupees 2,152 : 8 : 0, of the probable expense of constructing the Pucka Road along part of the North Bank of the Balliaghatta Canal.	Ditto, 3rd November 1840, No. .
No. 679. Letter from Military Board, dated 3rd November 1840, to the Governor of Bengal, transmitting the Estimate referred to in the Paper marked No. 678. with their recommendation, that it be sanctioned.	Ditto ditto, ditto.
No. 680. Letter from Superintendent of Canals, dated 20th November 1840, to Secretary to Military Board, transmitting the Financial Returns marked No. 679, a. to No. 679, f. inclusive, relative to the Canal Tolls for the half year, ending 31st October 1840, and remarking, among other observations, that there is at present a steady increase in the amount of Toll, and that the sum realized during this half year, exceeds that of the preceding one, by nearly 19,000 Rupees.	Ditto, 8th December 1840, No. 35.
No. 680. a. Statement of the Gross and Net Collection of the Tolls on the Calcutta Canals, from 1st May to 31st October 1840, the former amounting to Rupees 63,528 : 13 : 6, and the latter to Rupees 59,388 : 4 : 1.	Ditto ditto, No. 36.
No. 680. b. Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 31st October 1840.	Ditto ditto, ditto.
No. 680. c. Amount of Current Expense Bill in Toll Collection Account for the half year as above.	Ditto ditto, ditto.
No. 680. d. Comparative Statement of the Gross Collection, exclusive of Ferries and Fisheries made in the half year, commencing 1st May 1840-41.	Ditto ditto, ditto.
No. 680. e. Comparative Statement of the Collection, exclusive of Ferries and Fisheries made at different Toll Houses in the half year, ending as above.	Ditto ditto, ditto.

Military Board's Proceedings, 8th December 1840, No. 36.	No. 680. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 31st October 1840, shewing an increase of Boats paying Toll amounting to Rupees 11,702; and of small Boats 5,049; and of Canoes passing the Russa Station, 1,637.
Ditto ditto, ditto.	No. 681. Letter from Military Board, dated 8th December 1840, to Governor of Bengal, transmitting the Papers marked No. 680, No. 680, <i>a.</i> to No. 680, <i>f.</i> inclusive and recommending that the Rewards proposed to be allowed to certain Darogahs be sanctioned.
Ditto, 6th April 1841, No. 6.	No. 682. Letter from Mr. M. Crow, Deputy Collector, Punchanon Gram, dated 30th March 1841, to Secretary to Military Board, stating, that the Maps and other Documents connected with the Lands purchased by the late Canal Committee for the Circular Canal, and which were made over by the Board to the Deputy Collector of Calcutta, having been transferred to him, (Mr. Crow,) to enable him to adjust the accounts of those Lands, he requests to be permitted to inspect the Proceedings and other Records of the late Canal Committee, which are lodged in the Office of the Military Board.
Ditto ditto, No.	No. 683. Letter from Secretary to Military Board, dated 6th April 1841, to the Deputy Collector of Punchanon Gram, stating, that the Board have no objection to his examining or copying at their Office the Records referred to in his Letter of the 30th ultimo.
Ditto, 23rd April 1841, No. 24.	No. 684. Letter from Superintending Engineer, S. E. P., dated 20th August 1840, to Secretary to Military Board, in reply to his Letter of the 10th ultimo, transmits the Paper marked No. 684, <i>a.</i>
Ditto ditto, No. 25.	No. 684. <i>a.</i> Letter from Superintendent of Canals, dated 18th August 1840, to Superintending Engineer, S. E. P., stating, that he completed the examination of the six Bridges on the Circular Canal, and that he is now engaged with the six others on Tolley's Nullah, and that the result of his examination of the former is, that the Iron Work appears to be in almost all instances, in perfect order.
Ditto ditto, No. 26.	No. 685. Letter from Secretary to Military Board, dated 15th September 1840, to Superintending Engineer, S. E. P., in reply to his Letter of the 20th ultimo, approves of the expense incurred in effecting the examination of the Bridges.
Ditto, 22nd June 1841, No. 26.	No. 686. Letter from Accountant General, dated 16th June 1841, to Secretary to Military Board, with reference to the transfer of the accounts of the Canal Department to the Accountant Revenue

Department, requests that all Bills relating to the said Accounts be in future sent to that Office.	
No. 687. Letter from Superintendent of Canals, dated 29th May 1841, to Secretary to Military Board, transmitting with observations, the Financial Returns marked No. 687, <i>a.</i> to No. 687, <i>g</i> inclusive, relative to the Calcutta Canal Tolls during the past half year.	Military Board's Proceedings, 6th July 1841, No. 54.
No. 687. <i>a.</i> Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1840 to 30th April 1841, the former amounting to Rupees 1,02,213 : 3 : 7, and the latter, to Rupees 97,850 : 1 : 5.	Ditto ditto, ditto.
No. 687. <i>b.</i> Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 30th April 1841.	Ditto ditto, ditto.
No. 687. <i>c.</i> Amount of Current Expense Bill in the Toll Collection Account, for the half year ending as above.	Ditto ditto, ditto.
No. 687. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half year, commencing from 1st November 1840, exhibiting an increase of Rupees 24,966 : 4 : 3, over the past half year, ...	Ditto ditto, ditto.
No. 687. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries made at the different Toll Houses in the half year, ending 30th April 1841.	Ditto ditto, ditto.
No. 687. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for six months, ending 30th April 1841, exhibiting of Boats paying Toll Rupees 74,815, and of small Boats Rupees 16,688, and of Canoes at the Russa Station, paying Toll Rupees 16,835, and of small Canoes 669.	Ditto ditto, ditto.
No. 687. <i>g.</i> Return of Tickets-issued to Boats entering the Canals, and of those recovered from Boats quitting the same, shewing the number of Missing Tickets at each Station.	Ditto ditto, ditto.
No. 688. Letter from Superintendent of Canals, dated 22nd June 1841, to Secretary to Military Board, stating, that the present season of the year the Toll Collection usually falls to about $\frac{2}{3}$ of what it amounts to in the cold weather ; and that he therefore, would recommend that no appointment of an Assistant should at present take place ; and that he thinks it would not be expedient to transfer the Collection of Tolls to any other Office, as the Revenue would very likely fall off greatly ; and that he would be more harassed with Appeals or Suits for con-	Ditto ditto, No. 57.

fiscation in his capacity of Superintendent of Canals, instead of being able, as now, to settle them at once in a Summary manner.

Military Board's
Proceedings, 6th
July 1841, No.

No. 689. Letter from Military Board, dated 6th July 1841, to the Governor of Bengal, transmitting the Papers marked No. 687, and its enclosures, and stating, that the actual Toll Collections in the year 1840-41 amounts to Rupees 1,65,742 : 1 : 1, and which, when compared with that of 1839-40, shews an increase of Rupees 43,929 : 4 : 7, and of Rupees 1,05,898 : 15 : 8, as compared with that of 1838-39 ; that the Collections of the past half year exceeds that of the corresponding half of the preceding year by Rupees 38,684 : 6 : 1.

Ditto, 3rd August
1841, No. 3.

No. 690. Letter from Secretary to the Government of Bengal, dated 20th July 1841, to Military Board, in reply to their Letter of the 6th instant, states, that the result of the last half year's Canal Toll Collections are very satisfactory, and sanctions the suggestions of the Superintendent of Canals, of employing 4 additional Burkundazes and a Mohurir.

Ditto, 17th Sep-
tember 1841, No.
47.

No. 691. Letter from Superintending Engineer, dated 27th August 1841, to the Secretary to the Military Board, transmitting a Bill by the Superintendent of Canals, for expense incurred in excavating the Mud from the bed of the Intally Canal and from the Dhurrumtollah Cess Pool, amounting to Rupees 3,466 : 9 : 5, and recommending that the same be passed.

Ditto ditto, ditto.

No. 692. Letter from Secretary to Military Board, dated 17th September 1841, to Superintending Engineer, S. E. P., stating, that the Bill referred to in his Letter of the 27th ultimo has this day been passed.

Ditto, 24th Sep-
tember 1841, No.

No. 693. Letter from Superintending Engineer, S. E. P., dated 27th August 1841, to Secretary to Military Board, transmitting a Bill amounting to Rupees 220 : 9 : 0, for repairing the Barrackpore Bridge, and explaining, why the amount of this Bill is only half that of the Estimate.

Ditto, 13th Octo-
ber 1841, No. 25.

No. 694. Letter from Superintendent of Canals, dated 20th September 1841, to Secretary to Military Board, reporting, that he has lately received many applications for the letting of the Fishings at the spare Ground reserved for enlarging the Balliaghatta Docks if necessary ; and that he thinks that it would be advisable to put up the Fishery to Auction, where it may realise 75 or 80 Rupees per Annum ; and recommending that it be let to Mr. W. Prinsep at 72 Rupees per Annum, who would be a better tenant than the Natives, as he is willing to embank the whole spare Ground to form a Brine Field.

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No. 695. Letter from Secretary to Military Board, dated 13th October 1841, to Superintendent of Canals, in reply to his Letter of the 20th ultimo, authorizing him to Lease out by Public Auction to the highest bidder, the spare Ground referred to in his Letter, on the express understanding that the Lessee give up the Ground when required for public purposes. . . .	Military Board's Proceedings, 13th October 1841, No. 25.
No. 696. Letter from Superintending Engineer, S. E. P., dated 13th September 1841, to Secretary to Military Board, transmitting a Bill amounting to Rupees 1,743:2:0, by the Superintendent of Canals, for expense incurred in constructing the Pucka Road along the North Bank of the Balliaghatta Canal.	Ditto 19th October 1841, No.
No. 697. Letter from Superintendent of Canals, dated 3rd December 1841, to Secretary to Military Board, reporting, that on the 28th October last, he put up to Auction the Lease of the Farm of the spare Ground reserved for enlarging the Balliaghatta Docks, and that the highest bidder was W. Prinsep, Esq. to whom the Lease has been granted from the 1st ultimo, at an Annual Rent of Rupees 271, subject to the conditions detailed in the Military Board's Letter of the 13th October last.	Ditto, 6th December 1841, No. 21.
No. 698. Letter from Superintendent of Canals, dated 3rd January 1842, to Secretary to Military Board, reporting, that he has disposed by Public Auction of the Farm of the Circular Canal Ferry, for one year only, for Rupees 451. . . .	Ditto, 8th January 1842, No. 8.
No. 699. Letter from Superintendent of Canals, and Collector of Tolls, dated 4th January 1842, to Secretary to Military Board, transmitting correspondence relative to the receipt of Copper Coins in the Public Treasury, and stating, the inconvenience to which the Toll Darogahs are subject from being prohibited from paying any but New Pice into the Collector of 24-Per-gunnah's Treasury; and suggests, that as the Licensed Money-changers of Calcutta are supplied with Copper Money by Government at 64½ pice per Rupee, the Podars at Gurriah Haut, Tollygunge, and elsewhere, be permitted to purchase Pice from the Toll Darogahs at the same rate. . . .	Ditto ditto, No. 9.
No. 700. Letter from Secretary to Military Board, dated 8th January 1842, to Superintendent of Canals, and Collector of Tolls, approving of the suggestions contained in his Letter of the 4th instant, but thinks it would be better that the loss sustained in the Old Coin should be deducted from the Toll Collections. . . .	Ditto ditto, No. 10.
No. 701. Letter from Superintendent of Canals, dated 13th December 1841, to Secretary to Military Board, transmitting with observations, the Financial Returns marked No. 701. a. to No 701. g.	Ditto ditto, No. 27.

inclusive relative to the Calcutta Tolls for the half year ending 31st October last, and stating, that the anticipations expressed in the 5th Paragraph of his Letter of the 29th May 1841, have been more than realized.

Military Board's Proceedings, 8th January 1842, No.	No. 701. <i>a.</i> Statement of the Gross and Net Collection of the Tolls on the Calcutta Canal, from 1st May to 31st October 1841, the former amounting to Rupees 76,319:2:3, and the latter 71,754:8:1.
Ditto ditto, ditto.	No. 701. <i>b.</i> Explanation of the (Monthly) Receipts and Expenditure in the Toll Collection Accounts for the half year, ending 31st October 1841.
Ditto ditto, ditto.	No. 701. <i>c.</i> Amount of Current Expense Bill in Toll Collection Account for the half year, ending 31st October 1841.
Ditto ditto, ditto.	No. 701. <i>d.</i> Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries made in the half year as above, exhibiting an increase over the like months of the past year, of Rupees 12,828:4:9.
Ditto ditto, ditto.	No. 701. <i>e.</i> Comparative Statement of the Collections exclusive of Ferries and Fisheries made at the different Toll Houses, during the half year as above.
Ditto ditto, ditto.	No. 701. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for six months, ending 31st October 1841.
Ditto ditto, ditto.	No. 701. <i>g.</i> Return of Tickets issued to Boats, entering the Canal and of those recovered from Boats quitting the same, shewing the number of necessary Tickets at each Station.
Ditto ditto, ditto.	No. 702. Letter from Military Board, dated 8th January 1842, to the Governor of Bengal, transmitting the Paper marked No. 701, and its enclosures, and recommending that the Rewards, proposed by the Superintendent of Canals, be given to the Darogahs.
Ditto, 5th February 1842, No. 3.	No. 703. Letter from Deputy Secretary to the Government of Bengal, dated 25th January 1842, to Military Board, in reply to their Letter of the 8th instant, states, that the results of the Superintendent of Canals' management of Toll Collections are very satisfactory and creditable, and sanctions the Bonus of Rupees 600 to the Toll Darogahs.
Ditto, 26th February 1842, No.	No. 704. Bill by the Superintendent of Canals, for expense incurred in repairing the North Bank of Tolley's Nullah West of Allypore Bridge with piling, amounting to Co's. Rupees 142:11:2.

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- No. 705. Letter from Deputy Collector of Calcutta, dated 25th February 1842, to Secretary to Military Board, requesting to be furnished with a Memorandum, shewing the sums which may have been annually realized upon the Surplus Lands of the Circular Canal, previous to the transfer of the same to his Office, or while they were under the control of the Military Board, Military Board's Proceedings, 16th March 1842, No. 19.
- No. 706. Letter from Secretary to Military Board, dated 14th March 1842, to the Deputy Collector of Calcutta, in reply to his Letter of the 25th ultimo, transmits in original, a List shewing the amount for which the Surplus Lands were leased, prior to the Lease granted by them on the 1st September 1837, to Collychurn Dutt ; and states, that the Board are unable, from want of information, to forward a Memorandum, exhibiting the actual sums realized from renting the surplus Canal Lands ; but they believe, that he may obtain that information from the Chief Magistrate's Office, as the Leasing of the Lands in question after being approved of by Government, in their Secretary's Letter of the 6th March 1832, were placed under the Chief Magistrate's charge on the 13th of the above month, ... Ditto ditto, No. 20.
- No. 707. Letter from Superintendent of Canals, dated 6th April 1842, to Superintending Engineer, S. E. P., stating, that the Pucka Road on the North Bank of the Entally Canal requires to have its Metalling renewed, and requests permission to forward an Estimate for laying new Khoa, 6 inches thick, over its whole extent, which is 5,200 ft. by 15 feet, ... *
Ditto, 16th April 1842, No. 39.
- No. 708. Letter from Secretary to Military Board, dated 14th April 1842, to Superintending Engineer, S. E. P., stating, that the Board approve of the Superintendent of Canals transmitting the Estimate referred to in his Letter marked above as No. 707, Ditto ditto, No.
- No. 709. Letter No. 170, from Major W. R. Fitzgerald, Superintending Engineer, S. E. P., dated 16th May 1842, to Secretary to Military Board, replying to his Letter No. 7741, of the 16th ultimo, and No. 147, of the 11th instant, and transmitting the Papers marked No. 709. a. to No. 709. d. Ditto, 6th July 1842, No. 42
- No. 709. a. Letter No. 3138, from Superintending Engineer, S. E. P., dated 20th April 1842, to Superintendent of Canals, stating, that no Report having been received from his Office since 1837 respecting the Eastern Canals, requests him to furnish information respecting them, ... Ditto ditto, ditto.
- No. 709. b. Letter No. 314, from Superintendent of Canals, dated 30th April 1842, to Superintending Engineer, S. E. P., replying to his Letter No. 3138, of the 20th instant, ... Ditto ditto, No. 43.

Military Board's Proceedings, 6th July 1842, No. 42.	No. 709. c. Letter No. 111, from Superintending Engineer, S. E. P., dated 10th May 1842, to Superintendent of Canals, requesting him to state whether, if the proposition contained in the 10th Paragraph of his Letter No. 314, of the 30th ultimo, is sanctioned, he would then be able to visit the Eastern Canals and superintend the improvement of the Navigation, ...
Ditto ditto, No. 44.	No. 709. d. Letter from Superintendent of Canals, dated 11th May 1842, to Superintending Engineer, S. E. P., replying to his Letter of the 10th instant, ...
Ditto ditto, No. 45.	No. 710. Letter No. 325, from Superintending Engineer, S. E. P., dated 27th May 1842, to Secretary Military Board, in continuation of his Letter No. 170, of the 16th instant, transmits his Observations on the Eastern or Mofussil Canals, and the Superintendent of Canals management of the same, ...
Ditto ditto, No. 46.	No. 711. Letter No. 1339, from Secretary to Military Board, dated 6th July 1842, to Superintending Engineer, S. E. P., replying to his Letters Nos. 170 and 325, of the 16th and 27th May last, ...
Ditto, 13th July 1842, No. 44.	No. 712. Letter from Superintendent of Canals, dated the 30th May 1842, to Secretary to Military Board, transmitting with observations, seven Financial Returns, marked No. 712. a. to No. 712. g. relative to the Toll Collection for the half year, ending 30th April last; and stating, that he has fully realized the anticipation referred to in the 9th Paragraph of his Letter of the 13th December 1841, and states, that he attributes the deficiency in the Toll Collection to the late mercantile disasters, ...
Ditto ditto, No. 45.	No. 712. a. Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1841 to 30th April 1842, the former amounting to Rupees 83,879 : 3 : 8, and the latter to Rupees 79,661 : 14 : 0, ...
Ditto ditto, ditto.	No. 712. b. Explanation of the Receipts and Expenditure in the Toll Collection Account, for the half year, ending as above, ...
Ditto ditto, ditto.	No. 712. c. Amount of Current Expense Bill in the Toll Collection Account, for the half year, ending 30th April 1842, ...
Ditto ditto, ditto.	No. 712. d. Comparative Statement of the Gross Collection, exclusive of Ferries and Fisheries, made in the half year as above, shewing a decrease of Rupees 18,500 : 12 : 9 below the like months of 1840-41, ...
Ditto ditto, ditto.	No. 712. e. Comparative Statement of the Collections, exclusive of Ferries and Fisheries, made at the different Toll Houses in the half year, as above, ...

- No. 712. *f.* Comparative Statement of the number of Boats passing through the Canals for 6 months, ending as above, exhibiting a decrease at the four principal Stations of Boats, paying Toll, of Rs. 13,760 ; and an increase of small Boats of 3,227 ; and at the Russah Station, an increase of Canocs paying Toll, of 55 ; and of small Canocs 80.
- Military Board's
Proceedings, 13th
July 1842, No. 45.
- No. 712. *g.* Return of Tickets issued to Boats entering the Canal, including duplicates, and of those recovered from Boats quitting the same, including Boats broken up, bamboo rafts, &c., shewing the number of Missing Tickets at each Station.
- Ditto ditto, ditto.
- No. 713. Letter from Military Board, dated 12th July 1842, to the Deputy Governor of Bengal, transmitting the Papers marked No. 709, and its enclosures, with their remarks thereon. ...
- Ditto ditto, No. 46.
- No. 714. Letter from Superintendent of Canals, dated 11th July 1842, to Secretary to Military Board, requesting permission to advertise the re-sale of the Lease of the Ghoonee Magee Canal Fisheries, &c. on the line of the Eastern Canals.
- Ditto, 20th July
1842, No. 27.
- No. 715. Letter from Secretary to Military Board, dated 18th July 1842, to Superintendent of Canals, approving of the suggestion referred to in his Letter of the 11th instant.
- Ditto ditto, No.
- No. 716. Letter from Deputy Secretary to Government of Bengal, dated 25th July 1842, to the Military Board, in reply to their Letter of the 12th instant, sanctions the Bonus of Rupees 500 to three Darogahs ; and with reference to increasing the Salaries of those Officers suggested by the Superintendent of Canals, request the Board to call upon that Officer for his reasons more at large, for recommending such increase.
- Ditto, 6th August
1842, No. 7.
- No. 717. Letter from Secretary to Military Board, dated 4th August 1842, to Superintendent of Canals, requesting him to state the grounds upon which he recommends an increase to the Salary of the Toll Darogahs.
- Ditto ditto, No.
- No. 718. Letter from Superintending Engineer, S. E. P., dated 12th August 1842, to Secretary to Military Board, stating that much injury has been done to the South Bank of the Ballia-ghatta Canal by the late rains ; and that the Superintendent of Canals apprehends, it will be necessary to sacrifice the Carriage Road on the South Bank of the Intally and Ballia-ghatta Canals, in order to repair the above damage, unless considerable expense is incurred in piling and building a Wharf near the Jemmadar Station ; and that the repairs of the Slips must be postponed to the cold weather ; in the meantime, the Superintendent of Canals can be directed to submit an Estimate for the above.
- Ditto, 26th August
1842, No. 23.

- Military Board's
Proceedings, 20th
August 1842, No.
- No. 719. Letter from Secretary to Military Board, dated 18th August 1842, to Superintending Engineer, S. E. P., approving of the suggestions contained in his Letter of the 12th instant. ...
- Ditto, 27th August
1842, No. 82.
- No. 720. Letter No. 913, from Superintending Engineer, S. E. P., dated 22nd July 1842, to Secretary to Military Board, transmitting with observations the Paper marked No. 720 *a.* and recommending the transfer of the Canal Tolls to the civil authorities.
- Ditto ditto, No. 83.
- No. 720. *a.* Letter No. 75, from Superintendent of Canals, dated 21st July 1842, to Major W. R. Fitzgerald, Superintending Engineer, S. E. P., stating the nature and extent of the several appointments under his executive charge.
- Ditto ditto, ditto.
- No. 721. Letter No. 2456, from Secretary to Military Board, dated 25th August 1842, to Superintending Engineer, S. E. P., replying to his Letter No. 913, of the 22nd ultimo.
- Ditto, 26th October
1842, No. 15.
- No. 722. Letter from Secretary to Government of Bengal, dated 10th October 1842, to Military Board, in continuation of his Letter of the 25th July last, requests them to furnish a Comparative Statement* of Collections and Expenditure on account of the Tolls, and the purposes to which they are applicable from the furthest period, that it may be seen how far the Government has gained or lost by the Tolls.
- * See Appendix J.
No. XXXIX,
page 145.—J. M.
- Ditto ditto, No. 16.
- No. 723. Letter from Military Board, dated 24th October 1842, to the Deputy Governor of Bengal, in reply to Mr. Secretary Halliday's Letter of the 10th instant, states, that the information requested in that communication will be submitted to Government as soon as the Board have obtained a Statement, referring to the period when the Toll Collections were under the control of the Board of Revenue.
- Ditto ditto, No.
- No. 724. Letter from Secretary to Military Board, dated 24th October 1842, to Secretary to Revenue Board, requesting to be furnished with a Statement of the Gross Collections, the Outlay, and the Net Balance accruing to Government from the Circular and Eastern Canals and Tolley's Nullah for each year, previous to their coming under the charge of the Military Board in November 1836.
- Ditto ditto, No. 47.
- No. 725. Letter from Superintending Engineer, S. E. P., dated 14th September 1842, to Secretary to Military Board, transmitting the Paper marked No. 725 *a.* and stating, that he is disposed to concur generally in opinion with the Superintendent of Canals, with respect to being unfavorable to the system of Farming the Tolls on the Canals; but thinks if an exception could any where be made, it is to the Farming of the Tolls on the Canals in the vicinity of Calcutta.

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No. 725. a. Letter from Superintendent of Canals, dated 12th September 1842, to Superintending Engineer, S. E. P., submitting his sentiments on the Farming of the Canal Tolls, with reference to the Secretary to Military Board's Letter, No. 2,456, of 25th August 1842, to the Superintending Engineer, S. E. P. ...	Military Board's Proceedings, 26th October 1842, No.
No. 726. Letter from Secretary to Military Board, dated 26th October 1842, to Superintending Engineer, S. E. P., in reply to his Letter of the 14th September last, states, that the Board, on a consideration of the Papers before them, have decided against any present alteration in the system of Toll Collection now in force.	Ditto ditto, No.
No. 727. Letter from Superintendent of Canals, dated 27th October 1842, to Secretary to Military Board, transmitting with his recommendation, a Letter from Messrs. Carr, Tagore and Co., requesting that Mr. Prinsep's Lease of the Fishery near the Balliaghatta Dock, which expires on the 31st instant, may be renewed for another year.	Ditto, 2nd November 1842, No. 15.
No. 728. Letter from Secretary to Military Board, dated 1st November 1842, to Superintendent of Canals, with reference to his Letter of the 27th ultimo, sanctions the renewal of Mr. Prinsep's Lease for another year.	Ditto ditto, No.
No. 729. Letter from Superintendent of Canals, dated 6th November 1842, to Secretary to Military Board, reporting, that the Leases of the Ferries and Fisheries of the Calcutta Canals will expire on the 31st instant, and requesting permission to advertise them.	Ditto, 10th December 1842, No. 18.
No. 730. Letter from Secretary to Military Board, dated 10th December 1842, to Superintendent of Canals, sanctioning the suggestion contained in his Letter of the 6th ultimo, marked No. 729. ...	Ditto ditto, No.
No. 731. Petition of Goluckchunder Gustdar, dated , to Military Board, bringing to notice a case of Fraud against the Toll Darogah at Dhapa Chowkee.	Ditto, 24th December 1842, No. 17.
No. 732. Letter from Secretary to Military Board, dated 10th December 1842, to Superintendent of Canals, transmitting the Paper marked No. 731, and requesting him to report thereon. ...	Ditto ditto, No. 18.
No. 733. Letter from Superintendent of Canals, dated 15th December 1842, to Secretary to Military Board, with reference to his Letter of the 10th instant, submits an explanation, and states, that he thinks the charges in the Petition are mere fabrications got up to ruin the character of one of his (the Superintendent's) best Toll Darogahs.	Ditto ditto, No. 19.

- **Military Board's Proceedings, 21th December 1842, No. 22.** No. 731. Letter from Superintendent of Canals, dated 17th December 1842, to Secretary to Military Board, transmitting further proof of the Charges contained in Goluckchunder's Petition being false. ...
- Ditto ditto, No. 23. No. 735. Letter from Secretary to Military Board, dated 24th December 1842, to Superintendent of Canals, stating, that the explanation offered by him, with reference to the Petition of Goluckchunder Gustdar, appears quite satisfactory, and the Petitioner has been recommended to prefer his complaint to him, the Superintendent, in person.
- Ditto ditto, No. 25. No. 736. Letter from Superintending Engineer, S. E. P., dated 14th December 1842, to Secretary to Military Board, with reference to the Board's Letter of the 22nd December 1841, transmits a Sketch of the South Bank of Tolley's Nullah, between Kidderpore and Allypore Bridges, by the Superintendent of Canals, and states, that there is no Ground except a small portion of Khas Land belonging to Government on the South Bank of Tolley's Nullah; but that the Crews of Boats may make use of the North Bank of the Canal as a Towing-path, and that there is no absolute necessity for the formation of a new Towing-path on the South Bank of Tolley's Nullah, and recommends that the Estimate, dated October 1841, for the above, be cancelled.
- Ditto ditto, No. No. 737. Letter from Secretary to Military Board, dated 22nd December 1842, to Superintending Engineer, S. E. P., stating that the Estimate referred to in his Letter of the 14th instant, has been cancelled.
- Ditto, 21st January 1843, No. 66. No. 738. Letter from Capt. W. M. Smyth, Engineer, Officiating Collector of Tolls, dated 11th January 1843, to the Secretary to the Military Board, reporting his having received charge from Captain Boileau of the office of Collector of Tolls on the Calcutta Canals.
- Ditto, 4th February 1843, No. 22. No. 739. Letter from Capt. A. H. E. Boileau, Collector of Tolls, dated 24th, December 1842, to Secretary to Military Board, transmitting for the favourable consideration of the Board, a Petition from a Native Merchant, respecting the sale of his Boat which had sunk in the Balliaghatta Canal, laden with lime, and the heavy demurrage charged by the Government on the above Boat.
- Ditto ditto, ditto. No. 740. Letter from Secretary to Military Board, dated 12th January 1843, to the Superintendent of Canals, in reply to his Letter of the 24th ultimo, authorizing him to refund to the petitioner, Nittiroy, the amount suggested in his, the Superintendent of Canals, above communication marked No. 739.

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No. 741. Letters from the Military Board, dated 12th January 1843, to the Deputy Governor of Bengal, transmitting the Paper marked No. 739, and stating, that they have, in anticipation of His Honor's approval, authorized the Superintendent of Canals to refund to the petitioner Nittiroy the amount proposed by the above Officer.	Military Board's Proceedings, 4th February 1843, No. 23.
No. 742. Letter from Officiating Superintendent of Iron Suspension Bridges, dated 3rd February 1843, to Secretary to Military Board, reporting that the outer Gate of the Chitpore Lock will not work properly owing to the heel-post having sunk about 3 inches, in which state it has been several months, but could not be repaired during the Freshes, and that to repair the above will cost* about 90 Rs., and the passage through the Lock will be stopped 10 or 15 days.	Ditto, 8th February 1843, No. 31.
No. 743. Letters from Superintendent of Canals, dated 21st January 1843, to the Secretary to the Military Board, transmitting the Financial returns marked No. 743. a. to No. 743. g. inclusive, relative to the Canal Tolls for the half year, ending the 31st of October 1842, and stating, that he believes those returns fully realize the anticipations made regarding them, notwithstanding the disastrous Hurricane of the 3rd of June last; that a change has been introduced in the system of farming out the Ferries, Fisheries, &c. of the Moffussil Canals, the rents of which are now paid monthly instead of quarterly as heretofore, and are leased out from year to year instead of upon terms of three to five years, so that a public competition takes place annually, and Government have already derived considerable benefit from this arrangement, as will be reported separately in notifying to the Military Board the result of the sale by Auction of the Ferries and Fisheries on Tolley's Nullah, and on the Circular Canal, the leases of which are only current up to the 31st December 1842, and stating, that the total decrease during the half year has, as usual, been distributed in a very dissimilar manner among the different Toll Stations, and that he is inclined to think, that this is a very considerable criterion of the efficiency and trust worthiness of the respective <i>Daroghas</i>	* Sanctioned under Board's Letter, No. 6417, of 7th Feb. 1843.—J. M. Ditto, 24th March 1843, No. 58.
No. 743. a. Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st May 1842 to 31st October 1842, the former amounting to Rs. 70,648:13:6, and the latter to Rs. 66,357:14:4.	Ditto ditto, No. 59.
No. 743. b. Explanation of the Receipt and Expenditure in the Toll Collection Account, for the half year, ending as above.	Ditto ditto, No.
No. 743. c. Amount of Current Expense Bill in Toll Collection, for the half year, ending 31st October 1842.	Ditto ditto, No.

Military Board's Proceedings, 24th March 1843, No.	No. 743. <i>d.</i> Comparative Statement of the gross Collections, exclusive of Ferries and Fisheries, made in the half year as above, showing a deficiency of Rs. 5,963 : 11 : 3, or—7 : 9 per cent.
Ditto ditto, No.	No. 743. <i>e.</i> Comparative Statement of the Collections, exclusive of Ferries and Fisheries, made at the different Toll Stations during the half year, ending as above.
Ditto ditto, No.	No. 743. <i>f.</i> Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 31st October 1842, showing a decrease in four principal stations of Boats paying Toll of 5,010, and of small Boats 1,380 and of Canoes at the Russah station paying Toll, an increase of 3,425, and of small Canoes 444. ..
Ditto ditto, No.	No. 743. <i>g.</i> Return of Tickets issued to Boats entering the Canal, including duplicates, and of those recovered from Boats quitting the same, including Boats broken up, Bamboo Rafts, &c. shewing the number of missing Tickets at each station.
Ditto ditto, No.	No. 744. Letter from Military Board, dated 23rd March 1843, to Deputy Governor of Bengal, transmitting the Papers marked No. 743. No. 743. <i>a.</i> to No. 743. <i>g.</i> and its enclosures, with their remarks thereon.
Ditto, 31st March 1843, No. 50.	No. 745. Letter from Officiating Collector of Tolls, dated 22nd March 1843, to Secretary to Military Board, reporting on the ill conduct of the Toll Darogah at Dhapa, and transmitting correspondence connected therewith.
Ditto, 4th April 1843, No. 31.	No. 746. Letter from Capt. W. M. Smyth, Officiating Superintendent of Canals, dated 30th March 1843, to Secretary to Military Board, reporting his having this day made over charge of the Canals and Bridge Departments to Captain H. Goodwyn, of the Corps of Engineers.
Ditto, 18th April 1843, No. 80.	No. 747. Letter from Captain H. Goodwyn, Officiating Superintendent of Canals, dated 13th April 1843, to Secretary to Military Board, reporting his intention of proceeding on the 17th instant to inspect the Soondurbun Canals.
Ditto, 25th April 1843, No. 47.	No. 748. Letter from Officiating Superintendent of Canals, dated 13th April 1843, to Superintending Engineer, S. E. P., reporting that the bed of the Entally Canal is 3 feet 9 inches above that of the Circular Canal at the junction, that the above causes demurrage to Boats, whilst the effluvium from the Canal causes nausea and sickness.
Ditto ditto, No. 48.	No. 749. Letter from Superintending Engineer, S. E. P., dated 19th April 1843, to Secretary Military Board, states, that the Superintendent of Canals reports that the clearance of the Intallee Canal could not be effected before the rains, as the work will take fully three months, and this being the cultivating season,

- sufficient coolies could not be had, and recommends the work be deferred till November next.
- No. 750. Letter from Officiating Superintendent of Canals, dated 7th April 1843, to the Secretary to the Military Board, reporting on the delinquencies of the Dhappa Toll Darogah. Military Board's Proceedings, 28th April 1843, No. 20.
- No. 751. Letter from Officiating Collector of Tolls, dated 8th April 1843, to the Secretary Military Board, reporting the cause of reduction of Toll at Dhappa Chowkey, and recommending the removal of the Darogah. Ditto ditto, No. 21.
- No. 752. Letter from Officiating Collector of Tolls, dated 13th April 1843, to Secretary Military Board, explaining the cause of the Dhappa Darogah's removal from Office. Ditto ditto, No. 24.
- No. 753. Letter from Officiating Collector of Tolls, dated the 22nd April 1843, to the Secretary to the Military Board, referring a question respecting the limit of the Calcutta Canals, free to the holder of a Ticket. Ditto, 12th May 1843, No. 101.
- No. 754. Letter from Secretary to the Military Board, dated 12th May 1843, to the Superintendent of Canals, replying to his Letter of the 22nd instant. Ditto ditto, ditto.
- No. 755. Letter from Superintending Engineer, S. E. P., dated 11th May 1843, to the Secretary to the Military Board, transmitting with observations the Paper marked No. 755. a. Ditto, 6th June 1843, No. 79.
- No. 755. a. Letter from Officiating Superintendent of Canals, dated 23rd April 1843, to Superintending Engineer, S. E. P., reporting on the Eastern Canals and Tolley's Nullah, and works connected therewith. Ditto ditto, No. 80.
- No. 756. Letter from Officiating Superintendent of Canals, dated 1st June 1843, to the Secretary Military Board, reporting his having leased out the Fishery of the Chultabaria and Bhangor Canal for one year, for 350 Rupees. Ditto ditto, No. 72.
- No. 757. Letter from Secretary Military Board, dated the 6th June 1843, to Superintending Engineer, replying to his Letter of the 11th ultimo. Ditto ditto, ditto.
- No. 758. Letter from Officiating Collector of Tolls, dated 6th July 1843, to the Secretary to the Military Board, requesting permission to establish a subordinate Toll Station at a village situated a mile up the Kamarpokeria Khall. Ditto, 18th July 1843, No. 32.
- No. 759. Letter from Secretary Military Board, dated 15th July 1843, No. 1762, to the Officiating Collector of Tolls, replying to his Letter of the 6th July 1843. Ditto ditto, No. 33.

Military Board's Proceedings, 18th July 1843, No. 101.	No. 760. Letter from Officiating Collector of Tolls, dated 14th June 1843, to the Secretary to the Military Board, suggesting measures for remedying the great loss to the Revenue from the destruction of half Tickets upon which demurrage or Tolls are due, often to a considerable amount.
Ditto ditto, ditto.	No. 761. Letter from Secretary Military Board, dated 15th July 1843, to the Officiating Collector of Tolls, replying to his Letter of the 14th ultimo.
Ditto, 28th July 1843, No. 32.	No. 762. Letter from Superintending Engineer, S. E. P., dated 22nd July 1843, to Secretary to Military Board, stating, that Capt. Goodwyn reports that the cracks in the Wing-walls of the Tolleygung Bridge may be attributed to the Original Settlement of the masonry.
Ditto, 15th August 1843, No. 33.	No. 763. Letter from Superintending Engineer, S. E. P., dated 7th August 1843, to Secretary Military Board, states, that Capt. Goodwyn reports his having disposed of the six old Mud Boats for Rs. 270.
Ditto, 25th August 1843, No.	No. 764. Letter from Superintending Engineer, S. E. P., dated 26th July 1843, to the Secretary Military Board, transmitting a Bill amounting to Co's. Rs. 128 : 2 : 0, for repairing the North Bank of the Intallee Canal with rough piling.... ..
Ditto, 5th September 1843, No. 115.	No. 765. Letter from Officiating Collector of Tolls, dated 21st June 1843, to the Secretary Military Board, transmitting the Papers marked No. 765. a. to No. 765. g.
Ditto ditto, ditto.	No. 765. a. Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1842 to 30th April 1843. ...
Ditto ditto, ditto.	No. 765. b. Explanation of the Receipts and Expenditure in the Toll Collection Account for the half year, ending 30th April 1843.
Ditto ditto, ditto.	No. 765. c. Amount of Current Expense Bill in Toll Collection Account, for the half year, ending 30th April 1843.
Ditto ditto, ditto.	No. 765. d. Comparative Statement of the Gross Collections, exclusive of Ferries and Fisheries, made in the half year, commencing from 1st November 1842 to 1st May 1843.
Ditto ditto, ditto.	No. 765. e. Comparative Statement of the Collections, exclusive of Ferries and Fisheries, made at the different Toll Houses in the half year, ending 1st May 1843.
Ditto ditto, ditto.	No. 765. f. Comparative Statement of the number of Boats passing through the Canals for 6 months, ending 30th April 1843.
Ditto ditto, No. 117.	No. 765. g. Statement of Tickets issued to Boats entering the Canals, including duplicates, and of those received from Boats quit-

- ting the same, including Boats broken up, Bamboo Rafts, &c., showing the number of missing Tickets at each station. . .
- No. 766. Letter from Officiating Collector of Tolls, dated 1st August 1843, to Secretary Military Board, stating his inability to recommend any donations to Toll Darogahs.
- Military Board's
Proceedings, 5th
September 1843,
No, 117.
- No. 767. Letter from Military Board, dated 5th September 1843, to the Deputy Governor of Bengal, transmitting the Papers marked No. 765. *a.* to No. 765. *g.* inclusive.
- Ditto ditto, ditto
- No. 768. Letter from Superintending Engineer, S. E. P., dated 11th August 1843, to the Secretary to the Military Board, referring to his Letter No. 988, of the 6th June last, transmits with observations the Papers marked No. 768. *a.* to No. 768. *c.* inclusive
- Ditto, 12th Sep-
tember 1843, No.
63.
- No. 768. *a.* Estimate dated 30th June 1843, by the Officiating Superintendent of Canals, of the probable expense of cutting Jungle, repairing and remaking Tow-paths and by Draining Cuts, completing the tracking communication along the Eastern Canals, with reference to Orders of Military Board, contained in Superintending Engineer's Letter No. 533, of 12th June 1843.
- Ditto ditto, ditto.
- No. 768. *b.* Estimate dated 11th August 1843, by the Officiating Superintending Engineer, S. E. P., of the probable expense of cutting Jungle, repairing and remaking Tow-paths, Damming cuts, and completing the tracking communication along the Eastern Canals, amounting to Company's Rupees 4,365 : 11 : 10. . .
- Ditto ditto, ditto.
- No. 768. *c.* Estimate No. 7, by the same Officer, of the probable expense of Damming up the Gobrah Khall, amounting to Company's Rupees 5,347 : 6 : 0.
- Ditto ditto, ditto.
- No. 769. Letter from Military Board, dated the 9th September 1843, to the Deputy Governor of Bengal, transmitting the Papers marked No. 768, and No. 768. *a.* to No. 768. *c.* inclusive. . .
- Ditto ditto, ditto.
- No. 770. Letter No. 3194, from Secretary Military Board, dated 9th September 1843, to Superintending Engineer, S. E. P., in reply to his Letter No. 1247, of the 11th August 1843 last, states, that the Board doubts the practicability of bunding up the Gobra Khal, and with reference to former correspondence on the subject they request him to furnish to the Superintending Engineer, the Papers noted on the margin,* with the view to enable him and Captain Goodwyn to investigate the expediency of damming the Khall in question ; and stating, that the Estimate for making improvements to the Soondurbun Canals has been this day recommended to Government.
- Ditto ditto, ditto
- * Proceedings
14th April 1837,
Paper E. 16th June
1837, P.

- Military Board's
Proceedings, 29th
Dec. 1843, No. 61. No. 771. Letter from Superintending Engineer, S. E. P. dated 26th
September 1843, to Secretary to Military Board, transmitting
Captain Boileau's Bills for constructing an Iron Suspension
Bridge over the Circular Canal at Ooltadangah.
- Ditto, 19th January
1844, No. 33. No. 772. Letter from Superintendent of Canals, dated 4th December 1843,
to the Secretary to the Military Board, transmitting the Papers
marked No. 772 *a.* to No. 772 *g.* inclusive, and stating, that
the cause of the decrease of Tolls in Tolley's Nullah and
Baliaghatta Canal is owing to the difficulty of getting large Boats
through the former Channel and to the greater consumption of
coals instead of firewood, and to the closing of several rum distil-
ling establishments, and remarking upon certain missing Tickets.
- Ditto ditto, No. 31 No. 772. *a.* Statements of the Gross and Net Collection of the Tolls on the
Canals, from 1st May to 31st October 1843, the former amount-
ing to Rs. 66,997 : 2 : 3, and the latter to Rs. 63,000 : 15 : 1....
- Ditto ditto, ditto, No. 772. *b.* Explanation of the receipt and expenditure in the Toll Col-
lection Account for the half-year, ending as above.
- Ditto ditto, ditto No. 772. *c.* Amount of Current Expense Bill in Toll Collection Account
for the half year, ending the 31st October 1843.
- Ditto ditto, ditto No. 772. *d.* Comparative Statement of the Gross Collections, exclusive of
Ferries and Fisheries, made in the half year as above, showing
the increase and decrease, between the like months of 1842-43.
- Ditto ditto, ditto. No. 772. *e.* Comparative Statement of the Collections, exclusive of Ferries
and Fisheries, made at the different Toll Houses, in the half
year, ending as above.
- Ditto ditto, ditto No. 772. *f.* Comparative Statement of the number of Boats passing
through the Canal for 6 months, ending 31st October 1843. ..
- Ditto ditto, ditto. No. 772. *g.* Return of Tickets issued to Boats entering the Canals, includ-
ing duplicates and of those recovered from Boats quitting the
same, including the Boats, Bamboo Rafts, &c., showing the
number of missing Tickets at each station.
- Ditto ditto, No No. 773. Letter from Military Board, dated 17th January 1844, to the
Deputy Governor of Bengal, transmitting with observations
the Papers marked No. 772 No. 772 *a.* to No. 772 *g.* inclusive.
- Ditto ditto, ditto. No. 774. Letters from Secretary to the Military Board, dated 17th January
1844, to Captain Goodwyn, Superintendent of Canals, in reply
to his Letter marked No 772, states that as Captain Rutherford's
whole time and attention can be applied to the careful manage-
ment of the Toll Department, all errors of Collection are to be
remedied, and any perculation of the Darogahs brought to light.

*List of Papers subsequently obtained and omitted to be inserted in the
Index of Appendix to Appendix H.*

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No. 28. <i>a.</i> Abstract of Boats passing through the Bhaminghatta and Bhoj- dige Canals, ...	Military Board's Proceedings, 3rd May, 1831, No. 20.
No. 38½. Minute by D. McFarlan, Esq., on the Papers marked Nos. 36 and 36 <i>a</i> ,	Ditto 17th May 1831.
No. 95½. Letter dated 26th November 1831, from the Superintendent of Canals to Secretary to Military Board, adverting to his Letter of the 9th May, on the subject of the Lock Gates, ...	Ditto ditto, ditto.
No. 96½. Minutes of the Members recorded on the 17th May 1831, with reference to the Papers marked Nos. 28, 34 and 87 <i>a</i> , in this Appendix, ...	Ditto 10th July 1832.
No. 96½. Minutes of the Members recorded on the 10th July 1832, with reference to the Papers marked Nos. 95, 95 <i>a</i> and No. 95½, ..	Ditto ditto, ditto.
No. 97. <i>a.</i> Estimate for constructing a double Lock passage for the Circular Canal, amounting to Rs. 90,912, ...	Ditto ditto, ditto.
No. 97½. Minutes recorded by the Members of the Military Board, on the Papers marked Nos. 97 and 97 <i>a</i> , ...	Ditto ditto, ditto.
No. 99½. Minutes recorded by the Members of the Military Board on the Papers marked Nos. 98 to 99b½, ...	Ditto ditto, ditto.
No. 101½ <i>a</i> . Minutes recorded by the Members of the Military Board with reference to the Papers marked Nos. 101½ <i>a</i> to 101½ <i>f</i> , ..	Ditto ditto, ditto.
No. 325½. Letter from Superintending Engineer, L. P., dated 19th March 1835, to the Secretary to the Military Board, transmitting with observations the Papers marked Nos. 325½ <i>a</i> to No. 325½ <i>d</i> ⁽¹⁾ inclusive, ...	Ditto 15th De- cember 1835, No. 43.
No. 325½ <i>a</i> . Letter from Superintendent of Canals, dated 1st April 1835, to Superintending Engineer, L. P., reporting upon the Calcutta and Sunderbund Canals under his charge, ...	Ditto ditto, ditto.
No. 325½ <i>b</i> . Letter from Superintendent of Canals, dated 10th April, to Superintending Engineer, L. P., in continuation of the 12th para. of his Letter of the 1st instant, marked No. 325½ <i>a</i> , states the evil consequences of the present system of managing the Canals by making the necessary repairs on separate Estimates,	Ditto ditto, ditto.
No. 325½ <i>c</i> . Letter from Superintending Engineer, L. P., dated 4th May 1835, to Superintendent of Canals, replying to his two Letters marked Nos. 325 <i>a</i> and 325 <i>b</i> , ...	Ditto ditto, ditto.

Military Board's Proceedings, 15th December 1835, No. 43.	No. 325 $\frac{1}{2}$ d. Letter from Superintendent of Canals, dated 7th May 1835, to Superintending Engineer, L. P., in reply to his letter of the 4th instant, transmits the Papers marked No. 325 $\frac{1}{2}$ d and No. 325d ⁽¹⁾ ,
Ditto ditto, ditto.	No. 325d ⁽¹⁾ Abstract statement of the several works necessary for putting in repair the Canals and works connected with them, ...
Ditto ditto, ditto.	No. 328 $\frac{1}{2}$. Letter from Superintending Engineer, L. P., dated 3rd December 1835, to Secretary to Military Board, transmitting the Paper marked No. 329, ...
Ditto 22nd De- cember 1835, No. 59.	No. 329 $\frac{1}{4}$. Letter from Secretary to the Military Board, dated 22nd December 1835, to Superintending Engineer, L. P., stating in reply to his Letter of the 3rd instant, that the Board consider Capt. Thomson's report upon the progress made in constructing the Tow-paths on the Lake Channel very unsatisfactory, and requesting him to call upon Capt. Thomson for further information, ...
Ditto ditto, ditto.	No. 329 $\frac{1}{2}$. Letter from the Military Board, dated 22nd December 1835, to the Governor of Bengal, in reply to Secretary Mr. Prinsep's Letter No. 311, dated 11th ultimo, transmits the Paper marked No. 329, ...
Ditto 1st March 1836, No. 19.	No. 334a. Report dated 20th January 1836, by Overseer J. Greene to D. McFarlan, Esq., respecting the stoppage (owing to the dredging of the Entally Canal) of the Dhurumtollah Drain, and its effects on the Drains in its neighbourhood, and the insalubrity caused thereby, ...
Ditto ditto, ditto.	No. 334b. Letter from D. McFarlan, Esq., dated 20th January 1836, to Capt. J. Thomson, bringing to his notice the offensive state of the Dhurumtollah Drain, ...
Ditto ditto, ditto.	No. 334c. Report dated 24th February 1836, by Overseer J. Greene to D. McFarlan, Chief Magistrate, respecting the continued stoppages of the Dhurumtollah Drain, ...
Ditto ditto, ditto.	No. 334d. Letter from J. Prinsep, Esq., (no date) to D. McFarlan, Esq., respecting the stoppage of the Dhurumtollah Drain, ..
Ditto ditto, ditto.	No. 336 $\frac{1}{2}$. Letter from Secretary to Military Board, dated 4th March 1836, to Superintendent of Canals, requesting him to expedite the excavation of the Entally Canal, ...
Ditto ditto, ditto.	No. 356 $\frac{1}{2}$. Extract of Minutes recorded this day on the Paper marked No. 356, and its enclosures, by the Members of the Military Board, ..

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No. 361. Letter from Superintending Engineer, L. P., dated 30th August 1836, to Secretary to Military Board, transmitting the Paper marked No. 361a, ...		Military Board's Proceedings, 12th March 1836, No. 19.
No. 390 $\frac{1}{4}$. Memorandum respecting the rates of Toll formerly levied, ..		Ditto 29th March 1837, No. 85.
No. 390 $\frac{1}{2}$. Letter from Superintendent of Canals, dated 7th February 1837, to Secretary to Military Board, transmitting a statement of the Tolls collected on the Circular Canal, &c. during the month of January last, with a Table of Rates, ...		Ditto ditto, ditto.
No. 394 $\frac{1}{2}$. Letter from Superintendent of Canals, dated 11th March 1837, to Superintending Engineer, L. P., respecting the state of the Sunderbund Tow-paths, ...		Ditto ditto, ditto.
No. 402b. Letter from Superintendent of Canals, dated 19th September 1836, to Superintending Engineer, L. P., in continuation of his Letter of the 29th August 1836, ...		Ditto ditto, ditto.
No. 418 $\frac{1}{4}$. Letter from Superintending Engineer, L. P., dated 5th May 1837, to Secretary to Military Board, transmitting the Paper marked No. 418 $\frac{1}{2}$, ...		Ditto 16th June 1837, No. 37.
No. 418 $\frac{1}{2}$. Letter from Superintendent of Canals, dated 12th April 1837, to Superintending Engineer, L. P., transmitting Plans and Sections of the Gobra Khal, with his observations thereon, ..		Ditto ditto, ditto.
No. 418 $\frac{3}{4}$. Letter from Secretary to Military Board, dated 16th June 1837, to Superintending Engineer, L. P., replying to his Letter marked No. 418 $\frac{1}{2}$, respecting the damming up the Gobra Khal,		Ditto ditto, ditto.
No. 449a. Abstract showing the Total expence connected with dredging the Calcutta Canals, from 1st May 1834 to 1st May 1837, ..		
No. 563 $\frac{1}{2}$. Letter from Captain A. H. E. Boileau, Superintendent of Canals, dated 9th September 1839, to Major DeBude, upon the subject of renting the Ground of the Balliaghatta Docks, ..		

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ADDENDA TO APPENDIX TO APPENDIX, (II.)

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No. I. Extract Military Board's Annual Report, on the Calcutta and Soondurbun Canals, dated 29th January 1833, ...	i
No. II. Ditto dated the 25th February, 1834. 	ii
No. III. Ditto, ditto, the 13th March, 1835, ...	iii
No. IV. Ditto ditto, the 3rd May, 1836, ...	iv to v
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No. VIII. Ditto ditto, the 8th September, 1840, ...	xi to xiii
No. IX. Ditto ditto, the 30th April, 1841, ...	xiv & xv
No. X. Ditto ditto, the 31st December [? 2nd May,] 1842, ...	xv
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*Supplemental Papers relative to the Calcutta Canals, received from the
Office of the Secretary to Government, Revenue Department.*

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No. I. Letter from the Sudder Board of Revenue, dated 14th April 1829, to the Governor General in Council, transmitting the Paper marked, No. 1, a. and stating, with reference to the Orders of Government of the 29th November 1827, addressed to the late Presidency Board, directing, that the Acting Commissioner in the Soondurbuns should depute proper persons to measure and value the ground at Baminghatta required for the Eastern Canal; that they see no reason to object to the valuation stated in the three Statements annexed, of the estimated value of lands and trees, including compensation for the removal of huts, amounting to Rupees 10,771 : 10 : 8, and requesting authority for the Commissioner to disburse that amount. . .	Territorial Department Consultation, No. 1, 5th May 1829,
No. I. a. Letter from W. Dampier, Esq. Commissioner of the Soondurbuns, dated 31st January 1829, to the Secretary to the Sudder Board of Revenue, returning the Statement referred to as corrected, and stating, that he can only account for the Lakheraj Lands bearing so low a price in comparison with other Lands, from the circumstance of their unproductiveness, and stating, that not one complaint has been made relative to the lowness of the valuation of the Lands taken for the Eastern Canal.	Ditto ditto, ditto.
No. II. Letter from Deputy Secretary to Government, dated 5th May 1839, to Sudder Board of Revenue, requesting them to direct the Commissioner of Soondurbuns to make further inquiry on the subject of compensations payable for Lands taken for the Eastern Canal. Malgoozaree Land not to be purchased, but deductions from the Sudder Jumma to be granted, and a distinct compensation to be made for houses, trees, &c. . .	Ditto, ditto. No. 2, ditto.
No. III. Letter from J. Thomason, Esq. Deputy Secretary to the Government, dated 15th May 1832, to W. H. Macnaghten, Esq. Secretary to the Governor General, Revenue Department, transmitting for his Lordship's perusal, the Papers marked No. 88, and No. 89, in Appendix to Appendix II.	Revenue Department Consultation, No. 2, 13th May 1833.

Revenue Department Consultations, No. 3, 13th May 1833.

No. IV. Letter from Secretary to the Governor General, dated 26th June 1832, to J. Thomason, Esq. returning the Papers transmitted in his Letter of the 15th ultimo, and stating, that the Governor General observes, that the observations of Captain Jenkins, relative to the state of the new Soondurbun and Intally Canals, will remain for future consideration ; in the meantime, the remarks contained in the 10th Paragraph of that Officer's report seems to His Lordship to merit attention.

Ditto ditto, No. ditto.

No. V. Letter from J. Thomason, Esq. Deputy Secretary to Government, dated 10th July 1832, to Sudder Board of Revenue, directing their attention to an Extract, Paragraph 10, of a Letter dated 16th April last, addressed by Captain F. Jenkins to the Military Board, and requesting a report as to what stipulations have been made with the Grantees of Waste Lands in the Soondurbuns, to secure the right of tracking on the river face of their Grants.

Ditto ditto, No. 5, ditto.

No. VI. Letter from Secretary to the Sudder Board of Revenue, dated 3rd May 1833, to Secretary to Government, Revenue Department, with reference to the Deputy Secretary Mr. Thomason's Letter of the 10th July 1832, transmits the Paper marked No. VI. a.

Ditto ditto, No. 6, ditto.

No. VI. a. Letter from W. Dampier, Esq. Commissioner of the Soondurbuns, dated 22nd April 1833, to Secretary to the Sudder Board of Revenue, in reply to his Letter of the 16th instant, states, that no stipulations have been made with the Soondurbun Grantees as to the right of travelling and tracking ground on the river face of their several Grants, nor is he inclined to think such stipulation would be of any use, as the whole of the Canal route is through rapid Tide-ways, and the Boats by quitting at particular times the anchoring places, manage easily to reach the several points where the Tide changes, so as to take advantage of each Tide until they pass through the Jungle ; that any new stipulation with the Grantees would discourage them ; that laden Boats are seldom to be found tracking in the Tide-ways, as they find it better to wait for the flow or ebb as they require to move, than to exhaust their crews in tracking against the stream ; that if the tracts of Grounds between the River and the Bunds formed by the Grantees were cleared of Jungle, the Bunds would be exposed to constant encroachment from the River ; that the great danger of the Soondurbun passages is from stumps of trees which project from the bank of the Jungle Lands, and against which Boats are frequently forced by a sudden gust of wind or eddy of the Tide ; and that as the clearings go on, this evil will entirely cease to exist.

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No. VII. Letter from Secretary to the Sudder Board of Revenue, dated 1st April 1834, to Deputy Secretary to Government of Bengal, transmitting with reference to Mr. Secretary Macsween's Letter No. 1004, dated 24th September 1834, the Papers marked No. VII. <i>a.</i> to No. VII. <i>b.</i> ⁽¹⁾ inclusive with observations thereon.	Revenue Department Proceedings, 1st November 1836, No. 4.
No. VII. <i>a.</i> Minute by W. W. Bird, Esq. Member of the Sudder Board of Revenue, dated 29th January 1834, relative to regulating the Tolls of the Balliaghatta and Circular Canal, and transmitting the Paper marked No. VII. <i>a.</i> ⁽¹⁾	Ditto ditto, No. 5.
No. VII. <i>a.</i> ⁽¹⁾ Draft of a Regulation for modifying Regulation VII of 1810, and for Collecting a Toll on Boats passing through the Balliaghatta and Circular Canals.	Ditto ditto, ditto.
No. VII. <i>b.</i> Minute by J. Pattle, Esq., dated 27th February 1834, relative to regulating the Tolls of the Balliaghatta and Circular Canal and Tolley's Nullah, and transmitting the Paper marked No. VII. <i>b.</i> ⁽¹⁾	Ditto ditto, No. 6.
No. VII. <i>b.</i> ⁽¹⁾ Draft of a Regulation for rescinding Regulation VII of 1810, and for collecting a Toll on Boats passing through the Balliaghatta and Circular Canals and Tolley's Nullah. ..	Ditto ditto, ditto.
No. VIII. Letter from Secretary to Sudder Board of Revenue, dated 8th August 1834, to Secretary to Government in the Revenue Department, transmitting a Letter from the Secretary to the Military Board, (entered in Index to Appendix to Appendix H, as No. 195,) dated 25th July, with its enclosure from Captain Thomson, regarding the expense which is incurred in repairing the Road through which the Firewood dealers carry their wood to avoid the payment of Tolls, and begging that it may be taken into consideration, with the Board's Letter of the 1st April regarding the Canal.	Ditto ditto, ditto.
No. IX. Letter from Secretary to Sudder Board of Revenue, dated 23rd December 1834, to Secretary to Government in the Revenue Department, in continuation of Mr. Bushby's Letter of the 8th August, submits further communications from the Commissioner of Allypore Division, dated 3rd September 1834, with its enclosures* respecting the importation of Firewood by Land, &c., and requests early orders on the Board's Letter of 1st April respecting Draft of a Regulation for Regulating Tolls in the Circular Canal.	Ditto ditto, No. 7.

* Revenue Department Proceedings, 1st November 1836, No. 10. Letter from Hindoostanee Merchants of Calcutta, dated 12th February 1835, stating, that when Boats are obliged to come down by Banderkhawl or Soonderbund Canal, the Toll Officers stationed at Allypore Ghaut charge a duty of 2 Rs. per 100 maund on Merchandise Boats, while the rate of only one Rupee is levied on such Boats passing through the Jellinghee and other Rivers, and begging that the enhanced rate of Toll may be reduced.

Revenue Department Proceedings, 1st November 1836, No. 11. Letter from Shaik Lall Mahamod, dated 1st November 1836, to Secretary to Government, Judicial Department, offering to farm the Lease of the Tolls at Gurreah-haut, Tollygunge, &c. at Sa. Rs. 800 per annum, and proposes to give substantial security for the due fulfilment of his engagement in the event of his offer being accepted.

Revenue Department Proceedings,
1st November
1836, No. 16.

No. X. Letter from Secretary to Sudder Board of Revenue, dated 7th March 1836, to the Secretary to the Government of Bengal, in the Revenue Department, with reference to the Paragraph 2d of his Letter of the 2nd ultimo, suggests, that supervision of the Toll of Tolley's Nullah and Canals within the Collectorate of Calcutta be placed under Captain Thomson, the Superintendent of Canals, and calls attention to the Board's proposition for their improved management, to which they request a reply. .

Ditto ditto, No. 18.

No. XI. Letter from Superintendent of Canals, dated 12th May 1836, to Secretary to Government of Bengal, stating, that the Tolls collected at the Mouth of Tolley's Nullah between the River Hoogly and Kidderpore Bridge in the year 1835, amounted to Rupees 475.

Ditto ditto, No. 19.

No. XII. Letter from Secretary to Government of Bengal, dated 7th June 1836, to Secretary to Legislative Council, transmitting by the

Letter from the Military Board, dated 10th September 1833, with two Enclosures.

Letters to ditto and to Acting Secretary Sudder Board of Revenue, dated 24th September 1833.

From Military Board, 11th February 1834, and one Estimate.

From Acting Secretary Sudder Board of Revenue, dated 1st April 1834, and one Enclosure.

From ditto, 8th August 1834, Enclosure missing.

From ditto, 23rd December 1834, and two Enclosures.

From Military Board, 12th September 1834.

To ditto, 29th September 1834.

To ditto, 31st March 1835.

From ditto, 27th October and one Enclosure.

To ditto, 17th November and one Enclosure.

From ditto, 29th April 1836.

From Superintendent of Canals, 12th May 1836.

From Secretary to the Government of India, 6th April 1835.

To Military Board, 12th May 1835.

From ditto, 18th September, and two Enclosures.

From ditto, 20th January 1835, and one Enclosure.

To ditto, 6th February 1835.

From Secretary Sudder Board, 18th January 1836, with one Enclosure.

To ditto, 2nd February 1836, with one Enclosure.

From ditto, 7th March 1836, with one Enclosure.

From Military Board, 23rd January 1835, with an Estimate.

From ditto, 3rd March, with two Estimates.

Two Petitions of Natives.

desire of the Governor of Bengal, the Papers noted on the margin relative to the Eastern Bytuckhannah and Circular Canals, with the accompanying Draft of a Proposed Act for the future regulation and management of those lines of the Navigation, and requesting, that they may be laid before the Governor General of India in Council, and stating, that His Lordship's deliberations upon the subjects of the Papers transmitted have been assisted by the Committee of Officers whose names are entered on the margin,* and stating the conclusions arrived at.

* Mr. Pattle, Mr. McFarlan, Colonel Cragie, Major Irvine, Captain Thomson, and Mr. Mangles.

Ditto ditto, No. 20.

No. XII. a. Draft of a Proposed Act for the future regulation and management of Eastern Bytuckhannah and Circular Canals. . .

Ditto ditto, No. 21.

No. XIII. Letter from Secretary to the Government of India, dated 27th June 1836, to the Secretary to the Government of Bengal, in reply to his Letter of the 7th instant, states, that the Act referred to in his Letter, has been published for general information in an amended form, and returns the Papers transmitted with his communication.

No. XIV. Letter from Secretary to Government of Bengal, to Secretary of the Sudder Board of Revenue, dated 9th July 1836, requesting the Board's sentiments on the Draft of the Proposed Canal Act, published in the Calcutta Gazette of the 6th instant, either as regards its principles or its details, or both.	PAGE. Revenue Department Proceedings, 1st November 1836, No. 23.
No. XV. Letter from Secretary to Sudder Board of Revenue, dated 1st August 1836, to Secretary to Government of Bengal, in reply to his Letter of the 9th ultimo, transmits the Paper marked No. XV, a., and states that the Junior Member has been prevented from adding his opinion on the above Act, owing to his not having been furnished with the Papers connected with the Act till too late to make use of them.	Ditto ditto, No. 27.
No. XV. a. Original Minute of the Senior Member of the Sudder Board of Revenue, on the subject of the Proposed Act regarding the Canal Tolls.	Ditto ditto, ditto.
No. XVI. Letter from Secretary to Government of Bengal, dated 9th August 1836, to Secretary to Sudder Board of Revenue, acknowledging the receipt of his Letter of the 1st instant with its Enclosure, and directing that the Junior Member of the Board, Mr. Smith, may be requested to state his sentiments on the Canal Enactment under discussion.	Ditto ditto, No. 29.
No. XVII. Letter from Secretary to Sudder Board of Revenue, dated 3rd September 1836, to Secretary to Government of Bengal, transmitting in original, the Paper marked No. XVII, a.	Ditto ditto, No. 30.
No. XVII. a. Minute by C. W. Smith, Esq. Junior Member of the Sudder Board of Revenue, on the principles and details contained in the Proposed Canal Act, and Establishment of one uniform rate of Toll.	Ditto ditto, ditto.
No. XVIII. Letter from Secretary to Government of Bengal, dated 6th September 1836, to the Secretary to the Government of India, in the Legislative Department, in reply to his Letter of the 27th June last, transmits a Draft of the Proposed Act in an amended form, for the future regulation and management of the Circular and Eastern Canals, for the purpose of being laid before the Supreme Government, together with the Papers noted on the margin. Letter from Secretary to the Sudder Board of Revenue, dated 1st August, with Mr. Pattle's Minute. Ditto ditto, dated 3rd September, with Mr. Smith's Minute. Ditto, from Military Board, dated 29th July, with Enclosure from Mr. James Prinsep.	Ditto ditto, No. 31.
No. XIX. Letter from Secretary to Government of India, dated 26th September 1836, to Secretary to Government of Bengal, in reply to his Letter of the 6th instant, transmits a Copy of the Act marked No. XIX, a. passed this day into Law, and published for general information.	Ditto ditto, No. 32.

Revenue Department Proceedings, 1st November 1836, No. 33.	No. XIX. a. Act No. XXII, of 1836, for regulating Tolls in the Calcutta Canal, passed by the Right Honorable the Governor of India in Council. on the 26th September 1836.
Ditto ditto, No. 43.	No. XX. Rules passed by the Right Honorable the Governor of Bengal, under Act No. XXII, of 1836, published, as required by Section VII of that Act, for general information.
	No. XXI. Rules for the supervision and preservation of the Navigation of the Canals, specified in Act No. XXII, of 1836.
Ditto ditto, No. 46.	No. XXII. Letter from Secretary to the Government of Bengal, dated 1st November 1836, to the Secretary to the Sudder Board of Revenue, transmitting Paragraph 3rd of a Letter addressed by the Canal Committee on the 26th ultimo to Government, with orders to introduce a clause of the nature therein recommended in all future Soondurbun Grants, apprizing the Board at the same time, that the general Fiscal as well as Conservative Superintendence of the lines of Canal specified in Act No. XXII, of the present year, has been transferred to the Military Board.
Ditto 7th March 1837, No. 11.	No. XXIII. Letter from Secretary to Government, dated 20th December 1836, to the General Management of the Bengal Military Orphan Society, requesting them to state the precise extent to which the increase of Toll in Tolley's Nullah has injured the proceeds of the Orphan Gunge or Bazar.
Ditto ditto, No. 15.	No. XXIV. Letter from Secretary to Government, dated 7th March 1837, to the Secretary to the Orphan Society, stating, that the Regulation imposing an indiscriminate rate of Toll on Tolley's Nullah cannot be dispensed with in favour of that Society; and in regard to the diminished traffic of the Society's Bazar, refers them to a copy of the Superintendent of Canal's Report of the 5th January last.
Ditto ditto, No. 19.	No. XXV. Letter from Secretary to Government, dated 7th March 1837, to certain Traders frequenting Tolley's Nullah, stating in reply to their Petitions of the 28th December last, the inability of Government to grant the relief they solicit relative to the reduction in the rate of Toll in Tolley's Nullah, and stating, that measures will be shortly taken to deepen and improve the Navigation of the Canals.
Ditto 1st May 1838, No. 3.	No. XXVI. Letter from C Thackeray, Esq., dated 4th October 1837, to Secretary to Government of Bengal, respecting a Petition from certain Merchants and Traders, praying for a more equal adjustment of the Tolls on Tolley's Nullah, and begging that no final determination may be come to on that point without his being heard thereupon.

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No. XXVII. Letter from Secretary to Government of Bengal, dated 5th October 1837, to C. Thackeray, Esq. in reply to his communications of the 4th instant, states, that the Petition to which he refers has been sent to the Military Board for Report, and should any future communication with the Petitioners appear necessary, they will be duly informed to that effect.	Revenue Department Proceedings, 1st May 1838, No 4.
No. XXVIII. Letter from C. Thackeray, Esq., dated 28th November 1837, to Deputy Governor of Bengal, submitting his observations on the Report of the Military Board, upon the Petition of certain Merchants and Traders, complaining of the present mode of collecting the Tolls on Tolley's Nullah, which operates very grievously on them as Importers of Firewood.	Ditto ditto, No. 10.
No. XXIX. Letter from Secretary to Government of Bengal, dated 1st May 1838, to C. Thackeray, Esq., transmitting a Copy of the Resolution passed by His Honor the Deputy Governor on the 24th ultimo, reducing the rates of Tollage on the Calcutta Canals.	Ditto ditto, No. 24.
No. XXX. Letter from Secretary to the Sudder Board of Revenue, dated 5th June 1838, to Secretary to Government of Bengal, transmitting the Papers marked No. XXX, a. and No. XXX, b. prepared by the Accountant Revenue Department, shewing the results of the management of Tolls in Canals in the Lower Provinces for 1835-36.	Ditto 26th June 1838, No. 3.
No. XXX. a. Annual General Report of Gross Collections and Expenses and Net Collections, on account of Tolls at certain Canals. . .	Ditto ditto, ditto.
No. XXX. b. Annual Comparative General Report of Gross Collections on account of Tolls at certain Canals, for 1835-36, compared with 1834-35.	Ditto ditto, ditto.
No. XXXI. Extract Proceedings of the Honorable the President in Council, in the Military Department, under date the 24th December 1838, containing the notification of the appointment of Lieutenant A. H. E. Boileau, Engineers, to be Agent for Suspension Bridges and Superintendent of the Circular and Eastern Canals, vice Captain J. Thomson.	Ditto 15th January 1839, No. 1.
No. XXXII. Letter from Secretary to Government of Bengal, dated 4th June 1839, to the Accountant General, informing him, that the Military Board have been instructed to carry into effect the mode of paying into the 24-Pergunnahs' Treasury, the Canal Collections in the vicinity of Kidderpore.	Ditto 4th June 1839, No. 13.
<i>Extract Proceedings of the Honorable the Deputy Governor of Bengal in the General Department, under date 17th October 1838, containing the Papers marked No. XXXIII, to No. XXXIII, b., inclusive.</i>	Ditto 11th July 1839, No. 16.

Revenue Department Proceedings, 11th July 1839. No. 16.	No. XXXIII. Letter from the Board of Customs, Salt and Opium, dated 10th October 1838, to the Deputy Governor of Bengal, transmitting the Papers marked No. XXXIII, <i>a.</i> to No. XXXIII, <i>a.</i> ^(1b) inclusive, relative to exempting Mr. G. Prinsep's Boat, conveying Fuel for the use of the Salt Manufacture at Balliaghat Salt Works, from payment of Toll.
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> Letter from the Salt Agent of the 24-Pergunnahs, dated 20th August 1838, to Secretary to the Board of Customs, Salt and Opium, transmitting with observations, the Papers marked No. XXXIII, <i>a.</i> ⁽¹⁾ to No. XXXIII, <i>a.</i> ^(1b) relative to the Superintendent of Canal's refusal to allow Mr. Prinsep exemption from the payment of Toll Duties upon his Fuel Boats. ..
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> ⁽¹⁾ Letter from G. Prinsep, Esq., dated 28th July 1838, to the Salt Agent of the 24-Pergunnahs, transmitting with observations, the Papers marked No. XXXIII, <i>a.</i> ^(1a) and No. XXXIII, <i>a.</i> ^(1b) on the subject of (his) Mr. Prinsep's claim to exemption from Toll on all Firewood brought to his Balliaghatta Salt Works.
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> ^(1a) Copy of a Letter, dated 14th July 1838, from G. Prinsep, Esq. to the Superintendent of Canals, complaining that the Firewood consumed at the Balliaghatta Salt Works during the past season has been charged with the Canal Toll, which is opposed to the Government order in his favor, exempting Boats supplying his Salt Works with Fuel from Toll.
Ditto ditto, ditto.	No. XXXIII. <i>a.</i> ^(1b) Letter from Superintendent of Canals, dated 16th July 1838, to G. Prinsep, Esq. stating, that the Regulation of 1st November 1836, cancelled all former orders respecting exemption, as has been decided in the case of Boats with Troops, Treasure or Stores on Board.
Ditto ditto, ditto.	No. XXXIII. <i>b.</i> Ordered that a Copy of the foregoing Letter from the Board of Customs, Salt and Opium, and its Enclosures, be sent to the Revenue Department, in order that the Superintendent of Canals may be instructed to grant certificates to Mr. Prinsep's Boats conveying Fuel to his Salt Works.

Abstract of Despatches from the Government of India to the Honourable Court of Directors, relative to the subject of the Calcutta Canals and the Canal to Channel Creek.

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No. XXXIV. Extract of a Letter, dated the 15th December 1804, Revenue Department, to the Honourable the Court of Directors, transmitting the Papers noted on the margin, relative to the expiration on the 4th July last, of the Lease, granted to the widow of the late Colonel Tolley, of the Tolls on Tolley's Nullah and of its having been placed under the charge of the Board of Revenue, who have been directed to report on a new rate of Tolls, and on improving the Navigation of the Nullah.	{ Miscellaneous, " 31st May 1804. " 12th July 1804. " 15th July 1804. { Cons., " 10th Jan. 1805. " 15th Aug. 1805. " 19th & 26th Sept. 1805. " 17th Oct. 1805. " 21st & 29th Nov. 1805. " 13th & 19th Dec. 1805. { Cons., " 25th Oct. 1804. " 12th Nov. 1804.
No. XXXV. Ditto, dated the 15th May 1806, Revenue Department, to ditto, stating, that the Vice-President in Council had on the Reports furnished by the Board of Revenue, resolved on certain excavations being made for improving the Navigation of Tolley's Nullah, and transmitting the Papers noted on the margin.	{ Cons., " 15th May 1806, " 13th Dec. 1805. { Miscellaneous, " 29th Nov. 1805. " 15th May 1806, " 8th May 1806.
No. XXXVI. Ditto, dated the 30th July 1823, to ditto, referring to the 215th and following Paragraphs of the Despatch of the Government of India, dated the 30th July 1823, bringing to the Honourable Court's notice the Memoir submitted by Lieut. Schaleh, explanatory of a Plan for opening a Canal communication between the River Hoogly and the Ganges—state, that the present condition of the Government Finances is not only favourable to the completion of the above work, but an application of a portion of those Finances to public purposes is essential to the reputation of the Honourable Company; that a net receipt of Rupees 52,500 per annum from the Canal in question will bear Government harmless, and that there appears no cause to doubt that a more favourable result may not be realized—and mention, that they had received a communication from Mr. Wood, forwarding Plans and Estimates of a proposed Cut from Calcutta to Channel Creek, which they had referred to the Canal Committee, who referred them to Lieut. Schaleh, (who had formed a similar Plan to that of Mr. Wood's,) on the receipt of whose reply they gave the preference to Lieut. Schaleh's Plan, which the Government have sanctioned to be carried into effect at a cost not exceeding 5,06,217, and remark on the employment of a Steam Dredger.	
No. XXXVII. Ditto, dated the 29th June 1826, to ditto, referring to the 8th Paragraph of their Financial Letter, dated the 31st December 1824, report on the progress made in the construction of the Eastern Canals and the Canal to Channel Creek, Diamond Harbour, and the Iron Suspension Bridges.	

No. XXXVIII. Extract of a Letter, dated the 26th June 1828, to the Honourable Court of Directors, referring to the 147th and the following Paragraphs of Despatch of Bengal Government, dated the 29th June 1826, reporting the progress of the works under the Canal Committee's charge, state, what has been done in respect to the construction of Bridges and Canals subsequent to 1824, and the cost of constructing the Tide Way through the Salt Water Lake, and the purchase of ground for the Circular Canal.

No. XXXIX. Ditto, dated 23rd November 1830, to ditto, stating, that the information required by the Honourable the Court of Directors in their Despatch of the 10th September 1828, respecting the progress made in the several Canal Works from 1824 to 1826, has already been communicated in the Despatch of the Bengal Government of the 26th June 1828, and communicating the progress made during the year 1827.

No XL. Ditto, dated the 21st December 1830, to ditto, stating, that having no detailed information to submit with reference to any Despatch from the Honourable Court, they submit a review of the progress made in the several Canal Works during the years 1828 to 1830.

No. XLI. Ditto, dated the 27th October 1831, to ditto, being a continuation of the Despatch of the Government of Bengal, dated the 21st December 1830.

No. XLII. Ditto, dated the 6th December 1831, to ditto, on the subject of Ferry Boats in the Eastern Canals and Colonel Tickell's and Mr. James Prinsep's Reports on the advantages to be derived from the Circular and Eastern Canals, &c.

No. XLIII. Ditto, dated the 24th July 1832, to ditto, referring to the 13th Paragraph of the Mis. Rev. Despatch of the 16th August 1831, explain the cause of the great decrease in the gross receipts in 1829 and 1830, of Tolls levied in Tolley's Nullah and Balliaghatta Canal, which arose from the general falling off of Trade and the failure of the principal Agency Houses in Calcutta, and state, that the tenders for Farming the Canal Tolls have not been sufficiently favourable to warrant their being accepted.

No. XLIV. Ditto, dated the 26th July 1832, to ditto, in continuation of Paragraph 7th of the Despatch of the Government of India of the 6th December 1831, relative to the admission of Boats into the new Circular Canal, on payment for the present of a duty equal to 50 per cent. over and above the duty levied on Boats entering the Intally Canal.

No. XLV. Extract of a Letter, dated the 17th February 1834, relative to Mr. Prinsep's Report on the Canal operations during 1830, 1831 and 1832, and his suggestion for a modification in the Locks at Chitpore, and clearing out the Intally Canal. . .

No. XLVI. Ditto, dated the 28th June 1836, to ditto, stating that in the several Despatches from the Government of India specified on the margin, the Proceedings of the late Government up to the 10th November 1834, on subjects of Miscellaneous nature, were reported, and that the present Despatch narrates the Proceedings of the late Governour, Lord William Bentinck, and of the Honourable Sir Charles Metcalfe, on the same description of subject, up to the close of the year 1835, and transmitting Papers, relative to the degree of benefit which had been derived from the Circular Canal and from the consolidation of Tolls. . .

Narrative of the Miscellaneous Rev. Proceedings from 11th Nov. 1834, to 31st December 1835

No. XLVII. Ditto, dated the 29th November 1836, to ditto, relative to the Iron Bridge Department, &c.

No. XLVIII. Ditto, dated the 19th September 1837, relative to the Eastern Boitakanah and Circular Canals, and the subsidiary arrangements made under the Provision of Act No. XXII, of 1836, on the Regulation and management of those lines of Navigation.

No. XLIX. Ditto, dated the 28th April 1838, to ditto, replying to the Court's Letter No. 2, of 1807, on the subject of the Eastern and Circular Canals in respect to the fitness of the Chitpore Locks for the object of its construction, the means employed to remove the silt deposited in the Canal by the Calcutta Drains, the average number of Boats which pass the Canal daily, and the number which can pass in a day ; and what effect the mingling of the water of the Lake has had on the water of the River Hoogly.

No. L. Ditto, dated the 2nd June 1838, to ditto, relative to Captain Thompson's, Superintendent of Canals, Annual Report on the state of the Canals under his charge.

No. LI. Ditto, dated the 2nd July 1838, to ditto, with reference to the Despatch of the Bengal Government of the 2nd June last, state, that they have sanctioned the damming up of the Kowrah Pookreah Khal.

No. LII. Ditto, dated the 15th September 1838, to ditto, relative to illegal encroachments on Canal Lands.

No. LIII. Ditto, dated the 28th January 1839, to ditto, relative to the Tolls on Tolley's Nullah.

No. LIV. Extract of a Letter, dated the 1th April 1839, to the Honourable the Court of Directors, relative to the expediency of permitting Government Boats to pass free of Tollage through the Public Canals.

No. LV. Ditto, dated 5th September 1839, to ditto, relative to an Estimate for clearing out the Dhurramtollah Cess Pool... ..

No. LVI. Ditto, dated the 9th September 1839, to ditto, relative to the construction of a Dredging Boat.

No. LVII. Ditto, dated the 26th December 1839, to ditto, relative to arrangements made for paying the Toll Collections realized in the vicinity of the Kidderpore Bridge to the Treasury of the 24-Pergunnah Collectorate; and those realized nearer the Presidency, to the General Treasury.

Rev. General Letter No. 11, of 5th June 1840, Roads, Bridges and Canals, Mis. Rev. Proc. 22nd Oct. 1839, Nos. 1 and 2.

No. LVIII. Extract of a Despatch, dated 5th June 1840, No. 11, Paragraph 2, from the Government of Bengal, to the Honourable Court of Directors, transmitting the Papers noted on the margin, and stating, that they had complied with the Military Board's application for an extra establishment, in the Collecting Department, being allowed to the Superintendent of Canals.

Ibid, No. 14, of 9th July 1840, Tolls. Mis. Rev. Proc. 19th September 1839, No. 9 to 11, and No. 15, 28th November 1839, Nos. 3 & 4, 30th Jan. 1840, Nos. 4 and 5.

No. LIX. Ditto, dated 9th July 1840, No. 14, Para. 6, from ditto to ditto, transmitting the Papers noted on the margin, and stating, that among them will be found a Report on the Toll Collections of the Calcutta Canals under Act No. XXII, of 1836, during the half year ending 30th April 1839, which (including the Report submitted with Mr. Robertson's Despatch No. 12, dated 5th September 1839,) completes the whole year's receipt upon the reduced rate of Tollage brought in force under Orders of the 24th April 1838, as reported to the Honourable Court in Para. 42, of Colonel Morison's Despatch, No. 1, dated 28th January 1839, and that the satisfactory result noticed in the above Papers is to be attributed to the discharge of 2 dishonest Toll Dorogahs, and to the zeal and fidelity of those at Chitpore, Kidderpore and Pauspotah; to the removal of the Toll House a mile Westward from the head of the Lake Channel; to the discontinuance of the practice of employing unpaid Agency in receiving from the Toll Dorogahs, Collections for deposit in the General Treasury; and to the introduction of an improved method of ascertaining the Tonnage of Boats; and, with reference to the question discussed by the Military Board of Farming out the Tolls, no final orders have been passed upon the subject pending the receipt of the details of that Plan on which that measure was recommended.

	PAGE.
No. LX. Extract—Revenue General Letter, dated 29th October 1840, No. 21, Paragraph 2, from the Government of Bengal to the Hon'ble Court of Directors, stating that they had sanctioned at a cost of Rupees 4,528:10:6, the excavation of the deposit in the Entallee Canal, and remarking on Captain Boileau, Superintendent of Canals, having brought on his Cash Account the fines levied under the Canal rules, ...	Mis. Rev. Proc. 14th April 1840, Nos. 1 and 2.
No. LXI. Ditto, dated 13th March 1841, No. 4, Paras. 10 to 13, to ditto, transmitting the Papers noted on the margin, relative to the operations on the Calcutta Canals for the half-year ending 30th April 1840, and stating, that the results are highly satisfactory in a financial point of view, the amount of Tolls collected being 76,849:4:9 in excess of the first six months of the collections of 1837-38 and in 1838-39, which favourable results are to be ascribed to the active and judicious management of Captain Boileau, ...	Ditto, 21st July 1840, Nos. 4 to 6.
No. LXII. Ditto, dated 23rd March 1841, No. 6, Paras. 6 to 12, to ditto, transmitting the Papers noted on the margin, relative to the detention by the Superintendent of Canals of certain Company's Paper held as Security for the good conduct of one of the Toll Collectors, since detected in embezzling, and to an application by the Superintendent of Canals for remuneration as Collector of Tolls, and to certain rewards granted to the Toll Darogahs, ...	Ditto, 10th November 1840, Nos. 4 to 8.
No. LXIII. Ditto, dated 2nd June 1841, No. 13, Para. 7, transmitting the Papers noted on the margin, referring to the appointment of the Superintendent of Canals as a Magistrate of the Circular and Eastern Canals, ...	Ditto, 26th January 1841, No. 2.
No. LXIV. Ditto, dated 2nd June 1841, No. 13, Para. 15, with reference to Despatch No. 6, dated 23rd of March last, transmits the Papers noted on the margin, and states, that the Supreme Court have nonsuited the action brought against the Superintendent of Canals for the detention of certain Company's Papers deposited by one of the Toll Collectors as security, ..	Ditto, 23rd of March 1841, No. 1.
No. LXV. Ditto, dated 18th October, No. 27, Paras. 11 to 13, to ditto, transmitting the Papers noted on the margin, exhibiting the gross Collections, Charges and net Collection of Tolls on the Calcutta Canals, for the years 1838-39 and 1839-40, ...	Ditto, 20th of April 1841, Nos. 3 to 8.
No. LXVI. Ditto, dated 16th May 1842, Judicial General Letter, No. 13, Paras. 9 and 10, to ditto, transmitting the Papers noted on the margin, and stating, that they exhibit a very satisfactory account of the Toll Collections on the Calcutta Canals, ...	Rev. Proc. 25th January 1842, Nos. 37 and 38.

Rev. Proc. 5th
Feb. 1844, Nos. 33
to 35.
Ditto, 4th March.

No. LXVII. Extract—Revenue General Letter, dated 6th July 1844, Judicial General Letter, No. 14, Paras. 19 and 20, to ditto, transmitting the Papers noted on the margin, containing a half-yearly Report ending 31st October 1843, on the Toll Collections of the Calcutta Canals, showing a decrease of 3,651 Rupees in the amount realized, compared with the corresponding period of the preceding year; and stating that the grounds of the Military Board's objection to Farming* the Collections are, that, if the Toll Collections were entrusted to private agency, a wide field would be opened for imposition, exaction, and oppression, on the poorer classes of the trading community, ...

* See No. LIX.

No. LXVIII. Extract of a Letter from the Honorable the Court of Directors to the Governor General in Council, in the Revenue Department, dated 9th March 1831, No. 8, respecting the proceedings of the Saugor Island Society, and the proposed Canal to Saugor, upon which Canal the Court request an early communication of the Government's sentiments, ...

xx.

No. LXIX. Extract of a Letter from the Honorable Court of Directors to the Government of Bengal, in the Revenue Department, dated 25th September 1835, No. 6, respecting the Saugor Island Society's operations upon Saugor Island, and expressing their regret that the repeated efforts of the Government to induce the mercantile community to open a water communication between Calcutta and the lower Soondurbuns, were unsuccessful, ..

Ibid.

No. LXX. Letter from James Morris, Esq., dated 25th July 1845, to C. Beadon, Esq., Under-Secretary to Government of Bengal, requesting to be furnished with extracts from certain Dispatches of the Government of Bengal to the Honorable Court of Directors, ...

xxi.

The following Papers omitted to be inserted at pages, ix. x. and xi. of this Index.

Consultation 28th
July 1821, Nos. 6
and 7, 10th August,
Nos. 10 and 11, 21st
Ditto, Nos. 34 and
35, 3rd November,
No. 10.

No. XXXV½. Extract of a Letter from the Government of India, dated 1st August 1822, Paras. 215 to 225, to the Honorable Court of Directors, transmitting Lieut. Schalch's Memoir, explanatory of a plan for opening a permanent communication between the River Hooghly and the Ganges, and stating, that before coming to any decision on the plan, they have referred it to a Committee to report upon it.

No. XXXV½. Ditto, dated 19th June 1823, Para. Nos. 11 to 13, to ditto, referring to the intention of the Government to apply the Town Duty Collections to purposes of Local Improvements, and stating, that they do not doubt that the Honorable Court will cor-

dially feel the obligation, which the very possession of a large surplus appears to imply, of employing a part in measures calculated to raise the moral condition of the people ; to add to the comforts of the Community ; to enlarge the sources of wealth ; to facilitate Commercial intercourse ; and to correct the physical disadvantages of the country ; and remarking, that the expence incurred in the construction of Public works, if judiciously applied, can scarcely indeed be considered as a charge, as the disbursement will soon be repaid—inasmuch as sums disbursed for such beneficial purposes as above indicated, may be regarded rather as advances made to enhance the value and enlarge the wealth of the country than as the current expences of the Government, ...

No. XLII $\frac{1}{2}$. Extract of a Letter from the Governor General in Council, dated the 17th July 1832, No. 5, to ditto, transmitting with observations the Proceedings connected with the Saugor Island Society, and stating that the Government have failed in their repeated attempts to induce the mercantile community to undertake the project for improving the communication between Calcutta and the lower Sundurbuns, ...

xiv.

No. XLVII $\frac{1}{2}$. Extract of a Letter dated 21st February 1837, No 3, from the Government of Bengal, to the Honorable the Court of Directors, respecting the further Proceedings connected with the Saugor Island Society, ...

xv

APPENDIX TO APPENDIX (H)

No. 9.

[*No. 1 to No. 8 and the other numbers hereafter noticed, as “omitted,” of the Papers of the Index to Appendix to Appendix (H) are not deemed by the Municipal Committee necessary to be Printed.—J. M.*]

Minute by Lieutenant-Colonel Galloway on the New Circular and Sunderbun Canal.

I have perused those Papers⁽¹⁾ with much interest and attention—and, however unwilling I must naturally be, to express an opinion opposed to that of those who devised, who have recommended, or who have conducted the very extensive and enormously expensive operation of forcing, by means of Canals, a new communication between the Hooghly, immediately above the Town of Calcutta and the Ganges, by the ⁽²⁾Ishamuttee river, yet I cannot help saying, that to me, the project appears defective in design; to hold out no advantages commensurate at all with the cost of the undertaking; whilst I conceive it to be attended with considerable risk of injury to the Navigation of the Hooghly below Calcutta; and by no means altogether free from danger to a portion of that City.

The object contemplated seems to have been to shorten, and to facilitate, the Navigation of the Sunderbun passage into the great River, so as to obviate the difficulty which now opposes water communication with the Upper Provinces—by reason of the mouths of the Hooghly being shut to large, and even to lighter Craft, for several months of the year. It was therefore incumbent on those who proposed such a work as this, to shew at least, that the progress of Boats through the Sunderbuns, as compared with existing passages, would be expedited—not merely a little, but most essentially, before they could justify their call for such an expenditure of the public resources.—What has been the fact? Instead of Boats passing more expeditiously, we find that by the route of the Canal, compared with the old course in reaching the Ishamuttee, “there is a loss of a whole day for all Boats of a considerable draft of water using oars”—and that even “heavy Boats of burden, supposing them to require two tides instead of one, in reaching Attarabanka, would nevertheless perform the lower and old passage, in the same time as would be taken by the Canal route,” that is in the Canal, on which 13½ lakhs of Rupees have already been spent.—The original Estimate by Captain Schalch for the whole length of Canal was 9 Lakhs—as yet no operations have been carried on beyond the Ishamuttee river; which is not half the extent of line proposed:—another Estimate I perceive amounted to 10,27,350 Rupees—This is the report of Mr. James Prinsep, the present superintendent, who, in his scale of time required for making either passage, states the old route by Tolly’s Nullah to the Ishamuttee to require 22 hours, whilst, by the Canal, the time required is 34 hours; so

(1) Referring to Nos. 128, 130, 131, of App. (H)—J. M.

(2)? Gurroy.—J. M.

Mr. Prinsep’s Report.
Ibid.

that, instead of expedition, though the distance is shorter, *there is an impediment of 12 hours in 22 created by the New Canal.*

Now the reason of this I will explain; and it is here that the original defect in the project will be made manifest.

The country through which the Canal is cut is intersected by a number of Khals, or streams, many of which are deep and broad, and which, in some parts of the world, would be considered as Rivers; they are all within the influence of a strong Tide. The general direction of these streams is North and South, that of the Canal is East—consequently it intersects those streams.

(1) See plate marked No. 1.

Suppose then for the sake of illustration, any two of those streams *A, B*, running North be taken, and the Cut of Canal *C*, between them trending East—it is obvious that the Tide setting North in *A*, and in *B*, must meet in the Canal *C*, somewhere about half way, thus⁽¹⁾—so that a boat Eastward bound, and entering the Canal *C* with the Flood Tide making from *A*, will be carried only half way through the Canal, where it will remain in dead water, and its progress be opposed by the Tide from *B*, setting against it.

The same impediment exists in every other intersected part of the artificial Canal; and existing equally whether the Craft be Westward or Eastward bound: so that the length of the Cuts being so short as not to exhaust one Flood or Ebb to reach half way through them, it will be perceived that in the very principle of the project there is a fatal error—which indeed has been experienced—and it is the experience of this that has unquestionably given rise to the attempt to construct, what, in these Papers, is called “the Kullooar Dam,” a work which after a great expense in constructing, has given way to the united effects of a strong Tide, and the weight of a heavy inundation. This “Dam” was a Bund across the Kullooar Gong, or river, but it is manifest that the same means for checking contrafluent Tides are equally required for the other intersected streams, three or four of which indeed now appear to be proposed in Mr. James Prinsep’s Supplementary Report, dated the 3rd December last.

(2) See plate marked No. 2.

The way to form a system of Canals through such a country for the most expeditious passage Eastward, would be by diagonal lines of Canals running South East, thence, to North East, thus⁽²⁾—so as to fall in with the general direction of the Tides (which is North and South) for the sake of avoiding contrafluent Tides, and also in order to preserve, as much as may be, the strength of current. In such a system, if the length of each diagonal Cut were equal to a passage of one flow of Tide, a boat would make the passage of the Sunderbuns without one moment’s interruption, in as many Ebbs and Flows as there were diagonal Canals or Cuts; whereas, by the present system of direct Cuts, the Boat must anchor at half passage, either all the Ebbs or all the Floods, and consequently, the time of passage will be double.

Now it will probably be found, that the old Sunderbun passage (which is all by natural Streams, with the exception of the short Cut of Tolly’s Nullah) has in more or less perfection this essential requisite of diagonal direction, and hence it is, though the distance of that passage is considerably longer, yet that it is in fact the shortest, that is, in point of time.

But besides the radical defect, as to delay, the opposing Tides in the Canals produce slack water in them, and its necessary consequence—the deposit of Sand and Silt, which will in a comparatively short period choke the passage entirely.

These are errors which apply to the general scheme. I conceive that another great error has been committed in leading the Canal into the Salt Water Lake—this Lake, being too shallow, it was originally proposed to confine the Channel by means of Embankments and to increase the depth. It was found, however, that Embankments were impracticable, but dredging Machines could be used, and were had recourse to. They have however been employed to perform work for which such dredging Machines are but little calculated,

namely, the excavation of firm ground, instead of mere deposit—and I apprehend to little purpose, inasmuch as it is quite impossible in an open shallow Lake, to keep for any length of time a particular track through it at an extra depth, to say nothing of the sliding in of the sides and mud deposit there, from the annual inundation—even the motion of the water occasioned by the wind, will fill the Channel in a short period.

The Canal should have been carried along the Bank of the Lake, and the water in the Lake might then by means of Sluices have been made to scour the Canal; or the Canal might I presume have been made to drain the Lake, and thus to recover a very large tract of valuable land to Government, now a complete waste.

But more especially ought this to have been done with reference to the great difference of level between the Lake and the Hooghly, involving as it does the question of danger from irruption of the River. Had the Canal been carried round the verge of the Lake, a distance of 12 miles, instead of 7 or 8 as originally expected, (but $5\frac{1}{2}$ is only now available) might have been obtained through which to distribute the 12 feet of superior height of the River in the rains: which would have reduced the current in the Canal to a more moderate velocity.

Thus the Scheme appears to be defective in its original design.—I shall now shew that the advantages contemplated from the communication were obviously fallacious, and are utterly incommensurate with the enormous expense of the undertaking.

Captain Schalh himself says in his Printed Memoir of the present passage, by Tolly's Nullah "that when first excavated it (Tolly's Nullah) was perhaps sufficiently large for the Trade, &c.; but that it is quite inadequate to the present Navigation is evident from the fact, that at certain seasons of the year, when a free passage is most required it is choked up with Boats for a distance of three or four miles, &c. The increased population of the Town (of Calcutta) demanding a larger supply of fuel, the wood Boats, *which are the principal cause of obstruction in the Nullah*, have increased, &c.—*Memoir page—*"

Here then we find that the wood Boats are "the principal obstruction to" the old passage by Tolly's Nullah, which otherwise would not be "inadequate to the present Navigation," and we have seen by Mr. Prinsep's Report that this old passage is shorter than the new, in point of time, by 12 hours in twenty-two; so that we arrive at the conclusion that were it not for the wood Boats, the Canal would not be required; and as a consequence that the advantage of the new communication is limited to the accommodation of the Craft employed to supply Calcutta with firewood. But, after all, it appears that the number of Boats passing Tolly's Nullah, even including the numerous wood Boats, does not average 900 in a* month; therefore both passages being open, and supposing that one-half of these 900 Boats, in spite of the longer period by one-half required, shall nevertheless proceed by the Canal, the number of Boats passing would be 450 monthly—and the advantage to Government would be, that, 450 Boats would pay their Toll at Chitpore on the north of Calcutta, instead of paying at Tolly's Nullah on the south—and for which Government would have to keep up a double establishment of Toll gatherers. For the crowded state of Tolly's Nullah does not diminish the number of Boats which pass, although it must delay individual boats. The same quantity of fuel, I presume, is consumed in Calcutta, and must be brought.

Nor would a more open Canal induce Woodmen to bring more firewood without an increased demand; in point of fact, the demand has very much diminished, since the period at which Captain Schalh's Memoir appeared, from the diminished consumption of Bricks required for Buildings, and from the more general use of Coal for fuel as well as for burning the limited quantity of Bricks now in demand.

On the whole, therefore, it appears obvious, that the importance of the object in view cannot be deemed in any degree commensurate with the magnitude of the labor and ex-

(1) See App. to App. (G) page iv.

* See Register in Captain Prinsep's Report.

pense requisite to attain it.—I now purpose to shew, in the 3rd place, that the attainment of that object is undoubtedly attended with no inconsiderable risk to the Navigation of the Port of Calcutta.

Supposing the Canal to be opened as intended, and that there were no danger to be apprehended from an irruption of the River by it into the Salt Water Lake, it is manifest that every cubic inch of water which is admitted to pass from the Hooghly by the Canal, must in due proportion, diminish the velocity of the current from which it is withdrawn.

But velocity of current is indispensable near the mouth of every River, and especially of the muddy mouths of the Ganges. The obstruction, therefore, of so considerable a body of water from the River above the Port, and so near the verge of the Sea, the line of ultimate deposit, cannot possibly be harmless.

The danger to the Town of Calcutta from the irruption of the River by the Canal is the last mentioned objection to the scheme above noticed. In stating this objection the real questions are, What is the extent of danger from the scheme, and what is the amount of advantage to counterbalance that danger? For, were the advantage great, the danger might be tolerated. But we have seen that the advantages are not capable of balancing *any* degree of danger.

It will not be expected that the projector of a Scheme such as this, would amplify the danger that might result from its adoption. In perusing the Memoir of Captain Schalh, however, it must I think occur to every one, that although he endeavours to combat the fears entertained for the safety of Calcutta, yet he did not feel the same confidence in that respect which has since been evinced. In his original Plan, Captain Schalh states "that he avoided suggesting a communication between the River Hooghly and the Salt Lake," and the fact of his shutting out the River altogether by double bunds during the rains, can hardly escape notice. Captain Schalh, indeed, broadly declares his fears in the following words: "From the former velocity of current (of $2\frac{1}{2}$ miles in the dry season,) I should apprehend little danger either to the Bridges or to the sides of the Canal, but very reasonable fears may be entertained of the inability of the Bridges to withstand the latter, (the force of the current in the rains of $3\frac{3}{5}$ miles.) It is therefore my opinion, (*founded on this consideration alone*) that the communication between the River and the Lake should be obstructed during the rains."—Captain Schalh's Memoir, page 15 and 16.

See App. to App.
(G) page xx.

Captain Prinsep conceived, that he could regulate the influx of the River, notwithstanding the great difference of levels, though to him it was known that the range of Canal, over which to distribute the fall, was shortened from 7 or 8 miles, as expected by Captain Schalh, to $5\frac{1}{2}$ miles, by means of Locks or Flood Gates, instead of Bunds.*

It thus appears, that Captain Prinsep's opinion is opposed by that of the original projector, Captain Schalh, as to this part of a project, which involves, as some seem to apprehend, the safety of the Port of Calcutta, and probably a considerable portion of the Town.

But in the views taken by both those gentlemen, as to the principal grounds on which they estimate the extent of danger, namely, lightness of Current in the River and Canal, I cannot concur. They have indeed quoted Scientific writers in Europe, and have referred to the Chevalier de Buat and others for principles which regulate currents; and the velocity given by Rennell to the Ganges, viz. "in the rains 5 miles an hour, on a descent of 4 inches per mile," is brought forward in confirmation. But the essential fact on which the whole rests is omitted, namely, that the current stated by Rennell at 5 miles an hour, is the *average Current*, or as he calls it, "the *medium rate of motion*" of the *whole River*,

* I do not deem it necessary to enter into the question whether the preference is due to Bunds or Locks—for the latter might be shut altogether during the rains. The question is, the admission of the heavy current.

and not the current of any particular portion of it, much less of a portion like that of the Canal into the Salt Lake, where the fall, instead of 4 inches, is 30 inches per mile, 12 feet in $5\frac{1}{4}$ miles. On the contrary, Rennel positively states, and that too in the same work from which the quotations of a 5 mile current are taken, after noticing that "in the wet season and during the draining off the waters, the current runs from five to six miles an hour," adds, "but there are instances of its running seven and even eight miles in particular situations." "I have," he says, "an experiment of my own on record, in which my boat was carried 56 miles in 8 hours against so strong a wind that the boat had evidently on progressive motion through the water."—Memoir page 143. Such a passage as this, existing in the same work from which extracts are made, a work whose authority is quoted as the foundation or the support of the project itself, should not have been omitted. But what is the conclusion now that we see the omission? Why this—that if danger was to be apprehended—that if the foundation of Bridges could not resist, in Captain Schalch's opinion, a current even of $3\frac{3}{5}$ of a mile, the scheme must be altogether abandoned; for that there will and must be a current, at this spot, of fully twice $3\frac{3}{5}$ velocity, perhaps much more.

It seems to me however, to be not a little remarkable, whilst the Engineers employed in this undertaking have entered at large into speculative opinions, and have adduced data raised on the theories of other men to shew the safety of the plan, that no notice is taken of the accumulated velocity of current occasioned by the simultaneous effects of a strong Ebb Tide and a heavy Current pressing upon it; and it is still more extraordinary that they did not themselves go to the spot, and at the height of the rains, the period of danger, ascertain by trial, the real and true strength of the Current actually passing before the mouth of the Canal, and which it would have to encounter! If, as alleged, fears were unnecessary, this must have silenced them, or it must have terminated the scheme entirely. In all these voluminous Memoirs and Reports, I have seen no reference made to such an experiment; and in consequence, I have requested our Secretary to procure* through the Master Attendant, the requisite information, to be had no doubt in that Department, namely, the strength of Current in the Hooghly at the Ebbs of the Spring Tides in August and September, from Baloo Khal, about two miles above, and at the mouth of the intended Canal. When it is received it will be laid before the Board as an Appendix. But in the meantime, from personal knowledge, I may venture to say, that the Current at the spot in question is a very strong one, and I think must be 8 or 9 miles an hour at least; and be it here remembered, that it is the extreme highest Tide and Current that is to be guarded against; for a breach once made by one Tide through our soft alluvial soil and frail brick bulwark, on which the defence of Calcutta is to depend, the full extent of destruction, whatever that may be, is inevitable.

The Board must of course be unwilling to encourage alarm on an occasion like this, but the effects produced by the irruption of Rivers in this country must be familiar to us all. Captain Schalch himself describes these in very forcible terms in speaking of the Cut of *Sooty Canal* at the head of the Hooghly. "I saw the Cut," says he, "when only a few yards wide, but the stream was no sooner admitted, than it quickly expanded to as many hundred (yards,) and two years after its completion not a trace of its existence remained (as a Canal,) and only a few months ago the middle of one of the principal streams of the Ganges was pointed out to me as the spot where the excavation had been made." Here is a description by the projector himself, of the sudden and tremendous devastation which

* Vide No. 7. of [Military Board's] Proceedings, 15th February 1831. [In which the Master Attendant states that between Baloo Khal and Tolly's Nullah the Ebb, in his opinion, runs from 5 to 7 miles per hour during Spring Tides, in August and September.—J. M.]

this very River Hooghly made, at a point too, where there was hardly any fall, merely by straightening the line of current.

(1) See Plate
marked No. 3.

And this leads me further to observe, with reference to the position designed for the head of this Canal, that it opens into the Hooghly just at that point, or very nearly so, at which it will receive the whole strength of the Current straight from the Western Reach, which throws it up precisely in the direction of the Canal's mouth. This was probably seen, and to avoid its effects, the mouth of the Canal is made to incline with a curve to the Southward. But I question the propriety of this, for by looking at the progress Sketch for 1829-30, it would seem to render the first Flood Gate liable to be taken in reverse by any encroachment of the River, thus⁽¹⁾, where the triangular spit [spot] of ground *a, b, c*, appears to offer but little resistance; nor ought we, in judging of the danger of this scheme, to overlook the Report of Capt. Prinsep, as to the nature of the foundation to be obtained on this line of Canal. He states, that oozing sand (which oozing sand is described elsewhere to be a perfect fluid,) in fact a deep quicksand, is found at 18 feet below the surface in some parts,* and all along an average of 23 feet; whilst the Canal is to be excavated to the depth of from 15 to 19 feet. So that we have this danger also to encounter, and that too, not with the materials (large masses of stone) in use in Europe for such undertakings—nay, it is not even proposed to pile the foundation, substituting—no doubt influenced by economy—an inverted arch for the foundation and sill of the water-way; a very inferior expedient. In short, we have nothing but the infirm material of Brick, resting on an inferior stratum of clay, perhaps over a quicksand. These are the means and materials proposed to support a Flood Gate pressed by the weight of a heavy body of water, and the force of a powerful Current which it is made to oppose; forgetting also that such opposition will throw its latent force into heavy action downwards, so as to undermine the sill or pavement below, as well as laterally, where its swirl acting on either side may possibly lay the whole foundation completely bare, cut in behind it, and ultimately carry it away entirely.

That in a soil so tender as that of the alluvion of Bengal, this would be the effect of a heavy Current setting into this Canal, I think is by no means improbable. The safety proposed by Captain Prinsep, is by shutting out the River by means of these Gates, which were to shut of themselves. He says notwithstanding, "It is my intention to have "the means of fastening the Gates back when it is safe, reserving the power, in case "the stream should become too rapid for the safety of the Canal, of closing them, "and diminishing the flow of water at any time while the tide is flowing." Then a gage was to be fixed to the Gate, to shew when it was to be closed; and this Captain Prinsep believed would be when the water rose about 6 feet above the surface of the Lake—thus leaving a body of six feet more pressing against the Gate; and this he states, could not be a difficult matter to regulate, nor at all beyond the capacity of a native peon or a classie"—Report. We cannot say that there is no danger here. I have no such confidence in a peon or a classie, or in the scheme itself; we cannot conceal from ourselves the miscalculations as to the power of the River to be opposed: and which having been misconceived by those who have been recommending the scheme and carrying it on, have consequently not been provided against. It is indeed a very different thing to advocate the feasibility of this undertaking on the supposition that it will have to oppose a current of $3\frac{3}{5}$ miles, or even 5 miles only, and our sanctioning the proceeding with the work in the face of demonstration that the current is of double that intensity.

On these grounds I cannot hesitate to declare my conviction, that the scheme was injudicious from the beginning, and ought no longer to be persisted in. It has been imagined

* "At Chitpore cross Road," near which the Gates must be; in some parts, the "oozing sand was found at 19 feet." Captain Prinsep's intention to carry the foundation through the first bed of oozing sand, leaves it equally probable that a second bed exists, not far below the first.

that what is termed the Circular Canal,—that is, that part of the line which runs from the Hooghly to the Salt Water Lake,—has a distinct value, independent of the portion termed the Eastern Canal, and should be prosecuted to completion, though the other were abandoned. But the Circular Canal is part of the original scheme, and cannot be separated from it. I believe the position should be reversed, and that the Eastern Canal, if there be a distinction made, might possess a separate value, and not the Circular Canal, which is moreover that part of the scheme from which alone, whatever injury to the Navigation of the Hooghly or danger to the Town of Calcutta is to be apprehended, must arise. But were there no such apprehension, I can see nothing adequately valuable in this part of the work to induce me to countenance its separate prosecution, whilst it is extremely probable that it would produce such an alteration of level in the Lake as would materially injure the Drainage of Calcutta* as a Canal by itself, and as separated from the Eastern passage. I deem the Circular Canal insignificant; I consider the value of that Canal to depend on the Eastern Canal being useful. If a boat cannot pass through the Sunderbuns by it, of what use is it that it may get as far as the Salt Water Lake, then to be compelled to take the old route!

On the whole, therefore, I entirely concur in what indeed the present Superintendent, Mr. James Prinsep, has fairly and candidly stated, after enumerating in various instances, the impracticability of permanently completing the operations—"that experience has long since proved that Captain Schalch's scheme of a permanent line of Canals, crossing the upper ramifications of numerous tideways cannot be maintained in such a soil as that of the Sunderbuns, with sufficient depth for large Boats: whilst ample evidence has been afforded that it must soon become a series of tide Channels, passable only at high-water."

Appendix (H)
page 112.

Here is the conclusion, at length arrived at, with respect to the Eastern line; but I will go farther than Mr. Prinsep, and express my opinion, that the Western part of the scheme the "Circular Canal," is equally a failure, inasmuch as it is impossible that it can possess any real value, distinct from the other: at all events, it can possess no value which ought to induce the Board to recommend the continuance of an outlay on it which may yet exceed several lacks of rupees—whilst even the success of the operation, with reference to danger from irruption of the River and injury to the Navigation of the Hooghly, may (it is at least possible) prove the most unhappy circumstance attending this very imperfect and utterly successful undertaking.

Ibid,—page 84.

Finally, I will now endeavour to show, from Mr. James Prinsep's Report of the 15th September, and 3rd of December last, the present state of the Canal throughout, and the difficulties, which a perusal of these documents evidently warns us, do exist, in attempting to bring this work to a satisfactory conclusion.

Appendix (H)
No. 123, page 112.

A passage, such as it is, exists between the Entally Canal and the Ishamuttee by the new route, and its general condition is this.—"From communication with so many tide-ways there is," says Mr. Prinsep, "a rise in the Canal to the extent of the tide lift, so that at high-water there is a passage for the largest craft, and at low-water the bed is laid nearly dry at many places." "But, to place the Navigation on the best footing, the Kulloor Gunj, the Gobra, the Doodbeebie, and Kantatulla streams must be firmly bunded". "But the question of bunding resolves itself into the more general one—whether the new Navigation shall be that of tide passages as at present, (passing at the top of the tide) or a Canal". "To render it a system of Canals would require full 50,000 rupees laid out upon the three large bunds;† besides their constant protection from accident; for the several bunds on the Doodbeebie Khal were entirely carried away last rainy season." "To render it a tide

† But there are four bunds.

* Note.—Captain Prinsep does not admit this if his plan of gates be adopted; but he says—"There is however sufficient reason to suppose that it (the free admission of the tide, according to Captain Schalch's plan) would tend disadvantageously upon the present system of draining the Town."—Captain Prinsep's Report.

" passage requires only unavoidable repairs—the preservation of the tracking path, and to " clean out certain portions of the Bahmungutta, the Chultabarya, (the banks of which have " partly sunk) and other parts which impede the Navigation"—and to excavate deeper certain portions of certain " Canals unfinished," or " whose banks have fallen in". These are heavy items, and serious sources of expenditure in prospect.

But the work of excavation is not of so easy a nature. Mr. Prinsep says, in speaking of a portion of the Bayley Gunge Canal, " The earth of the Soonderbun alluvium is so " soft, that, when moistened with water it loses all trace of the spade, and acquires of itself " a level like treacle or pitch." In this Canal " it filled in from below, as fast as the laborers " removed it; at one place a sudden sliding in of 250 feet of the bank filled the bed $3\frac{1}{4}$ " feet."—Adjoining this " lay a stratum of sand of 600 feet, through which the excavation was made. After four feet deep was gained with some exertion, the oozing sand from below seemed to set at defiance all further endeavours"—" 875 feet remain to be excavated, 3 to 4 feet." " I refrain from estimating for this, being by no means confident of the practicability " of deepening such a soil in a permanent manner". " This Canal, the Committee are aware, " has already once filled in since it was excavated by Captain Schalch in 1824-25." " Concluding thus—" that experience has proved Captain Schalch's scheme of Canals im- " practicable for large boats:" " they must soon become Tide Channels, passable only at " high water."

These extracts give some idea of the obstacles opposed to the future success of the undertaking now before the Board, as they have been ascertained to exist by the test of experience, dearly as it has been bought—and certainly they are obstacles, which no stretch of prudence can justify us in continuing to oppose.

It is necessary however to state also the advantages enumerated by Mr. Prinsep to be derived from the new line of communication. " These are such as in Mr. Prinsep's opinion, " ensure it the preference over the deep and dangerous* streams of the Sunderbun forests, " for the frail boats which ply from the Eastward with wood, lime, fish, rice, mats, thatch, " vegetables and passengers"; and it is stated " that an average of 200 boats per day, from " the Dinghee to the 1000-maund Pulwar, pass through the Bahmunghatta Canal in Sep- " tember, when the Hooghly is open; so that it may be, he observes, expected that in the dry " season the traffic would be doubled".† Mr. Prinsep indeed states in his letter of the 3rd December, that " the wood boats from Roymungul tell him they save three days in their " trip" by the new route; but as this is directly opposed to his own experience, and to what he has distinctly reported, as above quoted, I am unable to reconcile the statements, and am disposed to think some mistake has been made—the more especially as the distance to the Roymungul, below the allotted lands, appears to be greater by the new than by the old route, " and as connected with the conveniency of the Canal" he begs leave to point " out the advantages of establishing villages along it," " Ferries also," and " Tolls should", he observes, " be imposed:"—the rates to be fixed however " with reference to the old route, being accessible to all."

These are advantages, no doubt; but they are of a very trivial nature: and, certainly not such as to warrant our recommending any outlay of public money at the present juncture in realizing them: all the articles above enumerated are abundant in Calcutta, and cheap;

* I am not aware of any danger in these passages as a reason for instituting the work—it could not be maintained.

† Note.—The Bahmunghatta Canal appears to extend about 10 miles beyond the end of the Entally Cut—we are not told where these boats are bound to; whilst in the Register kept at Tolly's Nullah, as above, the average number that pass is about 30 per day. I observe also, that of the " 200 boats here reckoned by Mr. Prinsep to pass Bahmunghatta," only 59 are what he classes as " large and middle size;"—the remaining 141 are " Dinghees," and " Saltee boats" still smaller than the Dinghee—see Statement E of his Appendix.

wood, lime, fish, rice, mats, thatch, vegetables—all these have always been abundant ; but on such articles I question whether any additional Toll or Tax could be imposed—certainly not without sending them all into Tolly's Nullah, as now. Mr. Prinsep indeed himself, in his Report of the 3rd of December, however unwilling naturally to abandon wholly and at once the undertaking, says “ I am inclined to recommend to the Committee to leave the works as at present, at least for a year or two, when a criterion may be formed of their success,” meaning however, that the Eastern, not the Circular, Canal, should be left.

Whether therefore we judge of the work from its own imperfection of design, or from the inadequate advantages it holds out, or now from the experience which has been obtained of its impracticability, as is manifest from these documents, I conceive the Board has but one duty to perform ; and that is, to express their decided opinion that the work should be immediately suspended, not merely as Mr. Prinsep designs, on the Eastern Branch thereof, but throughout the whole line of operations from the Hooghly Eastward: recommending that the whole establishments be paid up and discharged, and that all purchases of land for the Canal not yet completed, be in consequence, put a stop to.

I would further propose as immediately connected with this subject, that the Board direct those who may be in possession thereof, to furnish us without delay, with such information as may enable the Board to see the precise state of the direct communication between the Hooghly and the Ganges, by the Jellinghee, that being understood to be the passage most open at present, when I am not altogether without hopes that some measures may be devised for the better keeping open of the direct communication with the great River through the flats of that stream.

25th January, 1831.

(Signed) A. G.

I have seen answers by Captains Forbes, Colvin, and Fitzgerald, and by Mr. Kyd, to certain queries on the subject of the Flood Gates, but I do not consider them of any importance to the present questions.

CIRCULAR CANAL.

Since I wrote the former part of this Minute, I find that a greater degree of importance is attached to the “ Circular Canal,” than I conceive that part of the original scheme merits ; I am therefore induced to add the following to what I have above stated.

It is obvious that the only advantage anticipated from the continuance of the Circular Canal into the Hooghly, is that of opening a passage on the North side of Calcutta from the River into the Entally Canal, that boats may pass into it ; and continuing through the Salt Lake, make their way so as to join the *old route* through the Sunderbuns by Tolly's Nullah near Tarda, instead of going as now from the *South side* of Calcutta through Tolly's Nullah itself from the Hooghly. Were there no passage from the Hooghly by Tolly's Nullah, that indeed would be an object.—But as there is, what is the value of another passage ?* Is the Circular Canal to afford a shorter passage round Calcutta to the old route at Tarda ? I believe the distance is greater than by Tolly's Nullah by *space* ; and if reckoned by *time*, taking dead water and winds in the Salt Lake, the delay in passing Locks, &c., I apprehend the new route will be much the most disadvantageous.—Is it because Tolly's Nullah is choked up by Boats that a new passage is called for ?—This was argued by the projectors of the scheme. But will not the new Canal when opened, if frequented at all, in a month, after it is frequented, become also choked up ? Certainly it will—for this reason, as must be

* It is to be kept in mind that water communication with the Sunderbun old route exists as far as the Town now, and round a portion of it.

obvious to every one who has seen Tolly's Nullah—That Nullah is not choked up by boats merely in *passing*. Any number might pass through if not obstructed. It is by permitting the Nullah to become a Harbour, by boats lying there, laid up in ordinary there, and delivering cargo there, that Tolly's Nullah is obstructed—and this obstruction extends to a distance Eastward, beyond which it becomes no longer profitable to unload, on account of distance from the Town for land-carriage. This I conceive is what will always regulate the limit of obstruction; and were ten Canals cut instead of two, and they were all used as *Harbours*, they would all of them be choked as now; and in case of an opening into the Hooghly, with an additional reinforcement of blockading Boats from the River.

The remedy of a new Canal then (the Circular) I should conclude cannot be successful in this respect; whilst as a passage it can possess no advantage, but the contrary—being moreover saddled with the enormous incumbrance of locks which are not to be opened, and cannot be opened at all times.

What then is the remedy? That is the point; and fortunately it is a very simple one. Restore Tolly's Nullah to its original purpose—make it a *passage* merely—instead of Harbour, and the cost of any more Canalling will be entirely saved; and the apprehension of injury to the Navigation of the Hooghly and from irruption of the River will be obviated. This is to be done by imposing a continuation of Toll, on all boats which remain in the Nullah beyond a fixed time allowed for passage.

As far as water and way go, I understand Tolly's Nullah is a far better passage now than any we can contemplate by the new Canal through the Salt Lake; and it might easily be improved and kept free by means of scouring Sluices connected with the Bridges at present across it, at a much less expense, I conceive, than will be required for keeping open the Circular Canal, even were it successfully finished—a point which I by no means feel assured of attaining.

28th January, 1831.

(Signed) A. G.

No. 10.

MINUTE BY COL. SIR THOMAS ANBURY,
Chief Engineer.

I have perused with the utmost care and attention, the whole of the accompanying Papers, and with every consideration on the matter; and in vain have I searched for, and am consequently remain uninformed of the advantages that have resulted from the Mofussil works, or Sunderbund Canals, or what the return has been for the excessive expenditure they have incurred. It may not be perhaps irrelative to mention that in 1786 or 1787, I was employed, while Assistant in the Surveyor General's Office under the late Sir Mark Wood, and by him sent to explore a part of the Sunderbunds from Tolley's Nullah, via Tardah through the Creeks to the Jubboona or Issamutty, and thence to the Chogdah Nullah, a little above Ishapore; and the Report I believe was satisfactory that a Canal or Canals in that direction would be a hopeless undertaking, or one at an excessive cost bearing no proportion to the advantages likely to be obtained.

It seems in the present operation that Bunds are continually required to be made or renewed at a heavy cost, such as the Kulloar Dam (the position of which however I don't find in the map) without any exemplified Statement of the profits or advantages to be derived from the Muffussil or Circular Canals. Under these circumstances, and on full and mature consideration, I feel considerable difficulty in deciding whether the work ought

or ought not to be prosecuted ; the enormous sum of 13,00,000 of Rupees of outlay and no advantages apparently gained, or incomings stated in set off thereto, renders it I think, very questionable if such an expenditure should be persevered in without essential advantages commensurate with the expense being made more manifest.

I think the progress made on the grand Eastern Canal should be noted or marked on the Plan by some distinguishing colour ; and the separate cost of it and the Muffussil Canals should be separately detailed, when probably a better judgment might be formed.

(Signed) T. A.

No. 11.

MINUTE BY LIEUT. COLONEL CRAIGIE.

I have read with much attention Mr. Prinsep's Report of his operations on the Canals during the past year, and of his proposed scheme of operations during the present season.—I have also referred to the past proceedings of the Canal Committee connected with the execution of these important works, and have personally communicated on the same subject with some of the most scientific and intelligent individuals at the Presidency.—The result of my investigation is a decided conviction, that the scheme of operations proposed by Mr. Prinsep for the present season, should be approved, and more particularly that the execution of the Circular Canal should be prosecuted to completion with the utmost energy, in order that the Community and the State may as early as possible reap the benefit to be derived from that work, and from the other Canals already constructed.

It must be admitted I think, on a consideration of past Proceedings, that the execution of Major Schalch's original scheme of establishing a free communication between the Gurroy River at Koolna and the Hooghly at Chitpore, by means of a succession of Canals at the head of the Soonderbunds, has been found on experience to be attended with more difficulty and expense than the projector contemplated.—Mr. Prinsep in his present Report distinctly states, " Experience has however long since proved, that Captain Schalch's scheme " of a permanent line of Canal crossing the upper ramifications of numerous tide-ways " cannot be maintained in such a soil as that of the Soonderbunds with sufficient depth for " the Navigation of large Boats, while ample evidence has been afforded that it must soon " become a series of tide Channels, passable only at high-water." Mr. Prinsep adds, at the same time, that " as long however as the apex (if I may so term it) of each section is " situated at such a distance from the last as to occupy the period of one tide nearly in the " passage of a Boat from one to the other, there will be no great disadvantage in such a " scheme."

Appendix, (H)
page 107 and 128.

It must further, I think, be admitted, that the construction of the Canals which have been already executed through the Soonderbunds, has not in point of time been found productive of much advantage to the navigation—Boats it would appear can traverse the Delta by the old route as speedily as by the new route, notwithstanding the advantages of the Canals—on this point, Mr. Prinsep states, " still it must be confessed that nothing is gained in point of velocity by the new route, although one-third shorter than the old Soonderbund passage, for the same tides partially employed in the one case will transport a Boat over the longer distance with equal facility."

It seems thus to be established by Mr. Prinsep's Report, that the difficulty and expense of constructing Canals through the upper part of the Soonderbunds by the line pro-

posed by Major Schalch, are much greater than [than] was contemplated, while at the same time no saving of time is obtained in following the new route.

The chief advantages that seem to have been gained by the construction of the works in the Soonderbunds appear to consist in the diminution of danger from the avoidance of some of the largest Rivers, and in facilitating communication with particular points in the Soonderbunds. On these points, Mr. Prinsep states, "already the greater part of the Navigation has been attracted into the new Channel, and I encountered Boats of the largest size (1000-mds.) in my route. The wood Boats from the Roymungul tell me, that they save three days in their trip, besides the diminution of danger."—In another part of this Report Mr. Prinsep states, "The annexed statement (Appendix E) shews that an average of nearly 200 Boats per diem pass through the Bamunghatta Canal, (and consequently through the whole line, or at least from Mundaree) varying in size from the Dinghee to the 1000-mtd. Pulwar, during the month of September, when it must be remembered the whole Navigation from the Ganges is diverted from the Soonderbund route; so that it may be expected that the traffic by the Canal will be at least doubled in the dry season."

Under the results now established of the great difficulty of constructing real Canals in the Sunderbunds, and consequently of the little benefit in respect to time derived from pursuing the new route, I think Mr. Prinsep has been judicious in suggesting a discontinuance of the further prosecution of Major Schalch's plan of Canals through the Soonderbunds, and in recommending the Board "to leave the works as at present, at least for a year or two, when a criterion may be formed of their success"—the only expense to be incurred on the Canals already made in the Soonderbunds will be in repairs and in improving the tracking ground, which, according to the Estimate for the present year, will be inconsiderable, and in future years may be expected to be still less.

The difficulty which has been experienced in constructing and in maintaining Canals in the Soonderbunds, do not appear to me to justify a discontinuance of the prosecution of the Circular Canal at a time when the chief expense on that work has been already incurred both in the purchase of nearly the whole of the ground, and in the execution of nearly the whole of the excavation. The Appendix to Mr. Prinsep's Report shews that nearly the whole of this Canal has been already constructed, both in respect to excavation and Bridges, and that the works at Chitpore are the only portion of the undertaking of any magnitude which remains unfinished. Under such circumstances I cannot agree with Colonel Galloway in recommending a discontinuance of this work. On the contrary, I would urge the prosecution of the small portion of the Circular Canal which remains unfinished, with the utmost energy, convinced that the completion of this work will be attended with great and permanent advantage to the State and to the Community at large. I am not prepared to say, if the work were still to begin, and if no expenditure had taken place upon it, I would recommend its execution, on a conviction that the advantages to be derived from it would more than counterbalance the whole cost of the Canal. On that question I am not required to give an opinion, and therefore think it unnecessary to enter on its discussion here. I look at the advanced stage of the work at present, and at the expenditure which has already been incurred upon it, and then I hesitate not to say that I think it infinitely preferable to prosecute the work to completion, than to stop short when the Canal is almost on the eve of completion.

It appears to me quite certain that the construction of the Circular Canal, establishing as it will, an uninterrupted Navigation between the Hooghly and the Soonderbunds by means of the Eastern Canal, the Channel through the Salt Lake, and the Bamunghatta, (all of which are now open, and will be much benefited by the waters of the Circular Canal) must be attended with much benefit to the Public, and productive of considerable revenue to the State. These advantages, I think, will result even should the prosecution of

the line of communication through the Soonderbunds, according to Major Schaleh's plan, be stopped in its present stage, and yield no further advantages than are held out by Mr. Prinsep's present Report. I conceive I am supported in this view of the subject by the opinions expressed by the Committee which originally reported on Major Schaleh's plans in 1823, by the Resolution of Government under date the 20th March 1823, when sanctioning the construction of the Canal, and by the opinions expressed by the late Captain Thos. Prinsep, in several parts of his Reports. In the original Resolutions of Government, of the 20th March 1823, it is stated—"It seems to be very doubtful, whether any more direct line of communication between the River Hooghly and the Ganges can be rendered navigable throughout the dry season; and there is thence reason to conclude that the work will afford a very important facility to the trade of the Western Provinces.

"4. Independently, however, of this branch of Commerce, the great utility of the projected Canal appears to be fully established.

"5. The information procured by the Committee, in regard to the value and nature of the articles brought to Calcutta from the Eastern Districts of Bengal, is much less full and satisfactory than might have been expected from the Officers who were consulted.—That the commerce is very extensive, is however certain. The number of Boats which pass through Tolly's Nullah and the Eastern Canal; the large amount of the Collections drawn from that source; the throng of carriages on the road leading from Calcutta to the Salt Water Lake, are alone conclusive on the point. The bulky nature of the articles in which the commerce consists, the low value which they bear at the places whence they are brought, contrasted with their prices in the Calcutta Market, are all circumstances calculated to enhance the importance of a work, by which a considerable delay will be obviated, and the charges of freight considerably reduced.

"6. Government had not long ago occasion to notice the great enhancement which had occurred in the price of Firewood, of which article the chief part of the cost consists in the expense of carriage. Of all other necessities, the prices have risen with the rising prosperity of Calcutta; and in proportion as population extends, and the sphere whence supplies are drawn is enlarged, it becomes of course important that the means of conveyance should be facilitated.

"7. The Collections which may be made in the Canal in question, will no doubt partly consist of Tolls that would otherwise have been collected in Tolly's Nullah; but the insufficiency of that Channel has long been admitted. The delays and difficulties which occur in the passage through it, constitute a serious evil—it could be rendered adequate to the trade which passes through it, only by an operation involving an heavy expense not only through the charges of the excavation, but in the purchase of much valuable Land lying on its banks: and after all would only imperfectly provide for the objects in view."

"8. It is impossible to contemplate its present condition, crowded as it is with Boats, and affording a long and inconvenient passage to the Soonderbunds, without a strong conviction that the Community have reason to complain of the appropriation of the Toll levied. For greatly as Government must benefit by every facility given to trade, it is plain such imposts ought to be regarded less as a source of direct profit than as a fund to meet the charge of maintaining and extending the Channels of commercial intercourse.—Viewing the matter in this light, the Governor General in Council would doubt the propriety of maintaining the existing Tolls, were it his intention not to adopt any arrangement for facilitating the approach to Calcutta: and in the stated receipts from Tolly's Nullah and the Eastern Canal, he recognises at once an assured ground of confidence that the work proposed by Lieutenant Schaleh will be extensively beneficial, and that the expense of it may be met, without any pressure on the general resources of Government. All experience indeed

“ tends to shew that there is scarcely any application of capital more profitable than that which is directed to the object of improving the national advantages for internal Navigation, which the Delta of the Ganges presents; and that in sanctioning any work of this kind, the Question will generally be, not whether *Government cannot secure an adequate return; but, how far it ought to push the direct advantage, in consideration of the remoter*, though not less certain, benefit, of an improved Commercial intercourse.”

The foregoing Resolutions seem clearly to show, that the construction of the Canal in question was sanctioned by Government on the admitted insufficiency of Tolly's Nullah for the transit of the traffic between Calcutta and the Eastern Districts of Bengal, and on a perception of the commercial advantages that would result from opening a new Channel of communication between Calcutta and of the Soonderbunds, independent of the object of improving the communication with the Western Provinces.—The above advantages will be secured by the construction of the Circular Canal, which will admit the trade of the Eastern Districts of Bengal by the Bamunghatta Canal, the Channel through the Lake, and the Eastern Canal, the latter of which is always crowded with Boats, which would of course proceed onwards to the markets of Calcutta, if the Circular Canal were completed.

As it is manifest that Government considered the construction of the Canal in question to be justified on the grounds alone of its facilitating the communication between Calcutta and the Eastern Districts, it follows that any partial failure of the Soonderbund Canals, in effecting an improved communication with the Western provinces would not warrant, according to the views expressed in the Resolutions of Government, the abandonment of the Circular Canal, even if it had not been commenced upon, and cannot possibly justify the discontinuance of the work at the present time, when the chief expense has been already incurred, and when perhaps nine-tenths of the Canal has been executed.

I observe that the late Captain Prinsep, in his Reports to the Canal Committee, repeatedly expresses his opinion of the “superior importance” of the Circular Canal over the other parts of Major Schallch's plans, and presses the expediency of an early completion of the work. The present Superintendent of the Canals, Mr. James Prinsep, entertains the same opinions; and as far as I can ascertain, the community at large, are convinced, that great and permanent advantages will result from the execution of the Circular Canal.

In considering the amount which has been expended on the Canals in question, it is to be borne in mind, that a considerable portion of ground has been purchased on each side of the Circular Canal beyond what will be required for the Canal and Roads, and which when these works shall have been completed, there can be no doubt may be disposed of to great profit. This therefore will form an offset against the first cost of the Canal.

On a consideration of all these circumstances, I can have no hesitation in strongly urging the prosecution of this work to completion with the utmost vigor; the only circumstance that could now induce me to admit the expediency of discontinuing this work, would be a perception of danger from the admission of the Hooghly into the Canal at Chitpore, as pointed out by Colonel Galloway. Under the opinions which have been expressed by the several scientific Officers who have been consulted in this point, and under the knowledge of much more extensive works of a similar description having been successfully executed in England, in America, and on the Continent of Europe, I feel assured that no real danger will arise from opening the Canal into the Hooghly at Chitpore, and that the admission of the water into the Canal in the Rains may be regulated by Flood Gates, or by other contrivances, so as to secure the Canal and Calcutta from any possibility of injury.

31st January, 1831.

(Signed) JOHN CRAIGIE,

No. 12.

MINUTE.

[BY D. McFARLAN, ESQ.]

The papers originally circulated for the Board's consideration, were Mr. Prinsep's Report of progress in excavating Canals, &c., and a Sketch of what still remains to be done.

2. The Board have, upon a perusal of these documents, been led into a discussion of the soundness of the views which led to the original adoption of the plan, and Colonel Galloway proposes that Government should be addressed to relinquish the further prosecution of the undertaking.

3. A Member of the Board who should take up the question of the soundness or otherwise of the original scheme, is no doubt justified in stating his convictions fully to Government, but I do not feel that I am called upon to revert to such a scrutiny, more especially as Col. Galloway's proposition comes, in fact, in regard to the Eastern Canals, to the same thing as Mr. Prinsep's, viz. that the works should be let alone for the present, or nearly so.

4. It is only I apprehend in regard to the Circular Canal, that Col. Galloway recommends a materially different course from that proposed by Mr. Prinsep himself, and therefore, it is only in regard to that work that I am called upon to state my views.

5. With reference however to the Eastern Canals, I may mention, in passing, that I observed a fact stated, viz. that the trade of the country has been attracted to them; I cannot therefore think that the expense has been thrown away; whether the returns may prove commensurate with the expense, remains to be seen.

6. The statement that no time is gained in the passage through them, is taken from Mr. Prinsep's Report. I have every confidence in that gentleman's accuracy, and if I venture to suggest that perhaps it may appear that more time is gained than he allows, I am bound to say, that I have no precise data to refer to. I think however that the casual information I have derived both here and at Jessore, (from travellers and landholders) pointed to the fact that a great deal of time was gained by the new cuts, amounting indeed, to as much as the difference between three days, and a day and a half.

7. This point therefore should be kept open for further observation. I am of opinion also that every minor and not expensive operation, tending to facilitate transit, (such as clearing tracking paths) should be had recourse to, and a moderate toll begin to be levied as soon as it appears that the traffic of the country has become well accustomed to the navigation.

8. I now revert to the Circular Canal. The opposition to that work is partly founded upon the apprehension of danger to the town and its drainage, from letting in the water of the river; upon this point I think I am justified in placing confidence in them (or a majority of them) rather than in doubts that might be raised in my mind from other speculations.

9. If it could be shewn that the returns to be had from the outlay still necessary to complete the Circular Canal would be less than the expence, and as a consequence, that the advantage to the public would be trifling, we might then think of recommending to Government the entire dereliction of the scheme; but, if even under the discouraging prospect that no return whatever would ever be had from what has already been expended to the Eastward, there is a fair probability that what now remains to be disbursed upon the Circular Canal, would be returned in the shape of interest from Tolls, and increased comfort to the people of Calcutta and the interior, it would then clearly be politic to persevere.

10. That this will be the case, appears from the parallel instance of Tolly's Nulla, which has yielded a sure revenue in Tolls. Will there be no adequate return from a Canal having the advantages of proximity to the Town, communication with the River, uniform depth of water, connection with the new and old Soonderbun passages?

11. Supposing the works to be stopped, all that has been expended, is lost and sunk forever, with the exception of the ruinous re-sale of patches of ground covered with banks of mud:—suppose them carried on, and we have the fair prospect not only of tolls, but of advantageous sales of ground on the Banks for Warehouses and Wharfs. Let it be borne in mind also, that Government are by their own Resolutions pledged to improve the Navigation, or to give up the Tolls, on Tolly's Nullah. They said in 1823, that they could not continue to levy a Toll for so hampered a Navigation. How can they do so now?—If they do not finish this Cut, they must give up a Revenue of 70 or 80,000 Rupees annually.

12. I have no hesitation therefore in joining heartily in Col. Craigie's sentiments, and in recommending that the works of the Circular Canal should be pushed with the utmost vigor.

* Sanctioned by
Government.

13. The Eastern Canals may be left for the time in their present state, completing only the portion of the Bamunghutta Cut,* which remained unfinished from the early setting in of last year's rains.

14. The proposal for the formation of Dams across great Khalls for the purpose of stopping the access of tides from the Indian seas, had better, I think, be discountenanced. If we had no floods from the North, and Rocks for Foundations, the idea would be "bold" enough: in Bengal, with overwhelming Inundations from the North, and with a mud bank founded on a muddy or sandy foundation, and liable to saturation with water, nay, almost solution in the rains, as our only means of resistance, what chance can we have in the contest?

15. I am not sure that I am not going beyond my depth in the above remark; and it may perhaps be urged upon me, that the Flood Gates at Chitpoor, which I approve of, are likewise proposed upon similar bold suggestions; still, without presuming to add to the weight of authority in their favor, I may observe, that to my mind there must be a great difference between opposing the force of a current, and resisting the weight of a body of still water. The Mahratta Ditch has been open for many, many years, and I never heard of its having materially widened its bed; a small machinery would surely have stopped it altogether; why should not a stronger effectually stop the larger opening of the Canal?

16. I ought to apologize to the Board and the Government for not having gone more fully into the details of this question; my newness to the Board, and the manifold avocations incident to my other Office, which also is new to me, and new indeed in itself, must plead my excuse.

(Signed) D. McFARLAN,
Chief M. and M. M. B.

8th February, 1831.

No. 13.

ADDITIONAL MINUTE ON THE SUBJECT OF THE CIRCULAR CANAL. [BY D. McFARLAN, ESQ.]

Having further examined the history of the Marhatta Ditch, which was alluded to by me in my last Minute, I find that means have actually been taken to check the influx of water of the high inundations through the Ditch; a note of the particulars of which I beg to submit; it is supplied by Mr. Blechyenden, the Superintendent of Roads in the town, and its accuracy may be relied on.

The Sluice, the Board will observe, is not at Chitpore, but further to the Eastward, at Kanterpooker, and the real object in making it, appears to have been the protection of the Dum-Dum Road, as appears by the proceedings of the Magistrates of 2d November 1802. The protection of the Northern part of the Town was only incidentally mentioned.

As the above fact, and the others noted in Mr. Blechyenden's Report strengthen the conclusion arrived at in my former Minute, I beg the Secretary will be good enough to annex this paper to it.

(Signed) D. McFARLAN,
Chief Magistrate and M. M. B.

No. 13. a.

Mr. Blechynden will be good enough to note, for the information of the Chief Magistrate, what is the practice adopted for regulating the flow of water through the Mahratta Ditch, at the high spring tides in the rains, and what is the strength and description of the Machinery used to keep it out, if it is kept out; also, whether or not, it is the case that the water at those times penetrates through the Tunnels into the town, and makes its way Eastward.

10th February, 1831.

(Signed) D. McFARLAN,
Chief Magistrate.

In reply to the Queries of the Chief Magistrate, I beg to state—

1st. That the water is only partially kept out by sluices, according to the directions of the persons under whose immediate charge they are placed.

2nd. The sluice is occasionally opened at Kanterpooker (near the Baug Bazar branch of the Barrackpore Road) for supply of water to irrigate the Paddy lands, lying between Dum-Dum and the Salt Water Lake; as also at certain periods to prevent inundation to the low part of Baug Bazar, which would be the case, were the water pent up in that direction.

3rd. The sluices are of double planked Teak wood, well secured with Iron-work, and formed on the self-acting principle.

4th. The water does occasionally obtain entrance into the Town through the Tunnels, and assists in removing the filth collected therein.

5th. In addition to the sluice at Kanterpooker, one is placed at the Bankshall, which also carries water through the Tunnels into the Mahratta Ditch.

6th. At Bewannypore are sluices on a like principle, for the purpose of keeping the water from Tolly's Nullah out of the Town, when not required for the clearing the Drains.

It might perhaps be worthy of observation, that the opening of the New Canal might render new sluices requisite, for the purpose of irrigating the Rice fields near the Salt Water Lake at certain periods, as well as to prevent a too great influx of water into the Eastern part of the city.

14th February, 1831.

(Signed) A. H. BLECHYNDEN,
Superintendent.

(Signed) D. McFARLAN,
Chief Magistrate.

No. 14.

SEPARATE MINUTE, CHIEF ENGINEER.

Independent of the question of present or future advantage to be derived from the Eastern or Soonderbund Canals, on which the Government have, already, clearly expressed their views, in their Resolutions of the 20th March, 1823, and their opinion of their utility in affording "a very important facility to the Trade of the Western Provinces;" and after what has been advanced in the Minutes of the several members of the Board, I shall confine myself to the subject of the Circular Canal. After the expense, already incurred, in the purchase of ground in the direct line of the Canal, and on both sides, which on the completion of the excavation and opening of the Canal will become abundantly valuable; and if not retained for Ghauts, Wharfs, or other purposes, will by resale, produce a con-

siderable return on the original outlay; for I think it is hardly to be doubted, that there will be numberless individuals anxious for purchase, when the utility and benefits resulting from the Canal in a Commercial, as well as other views, becomes more evident or certain; besides the greatest portion, indeed nearly the whole, of the intended Canal being now excavated, as appears by the Progress plan, and little more to do than the setting up of the Flood Gates, it ought not in its present state to be abandoned; on the contrary, I am decidedly of opinion, that, whether it fully answers the original purpose intended, or not, after such an expense, it ought to be prosecuted to completion—and that agreeable to Mr. James Prinsep's recommendation; the Eastern Canal may be allowed to remain as it is—save as far as regards the necessary towing paths and requisite repairs to Bunds, essentially necessary for the protection of what has been already done.

The security of the debouchment of the Circular Canal towards the Hoogly, I have no apprehension from; as I have no doubt its security has been well provided for by the Superintendent, and that the known means of readily opening and closing of the Flood Gates, which I deem absolutely necessary, will be adopted. Under such precautions, I can have no question of the water of the Canal and the River being kept under due control. The replies of the four Savans, to whom the Queries relative to this point have been referred, confirm my opinion; and if the bank of the river, on each flank, is well secured towards the river, I cannot imagine any possible danger. The Mahratta Ditch is, in my recollection, now upwards of 46 years, and I never heard of any accident or danger apprehended therefrom, and I know it has been frequently contemplated as a means of connection between the Hoogly and the Salt Water Lake. It is next to superfluous to add, that I perfectly coincide in the opinions and sentiments of Mr. McFarlan and Col. Craigie, that the Circular Canal should be pushed on to conclusion with the utmost vigor, and that, any further, very expensive operations should be discontinued on the Eastern or Sunderbund Canal, without any reference to any future returns or advantages therefrom.

12th February.

(Signed) THOS. ANBUREY.

Since writing the above, I have had an opportunity of examining the model of the Flood Gates, which I am satisfied with.

(Signed) T. A.

No. 15.

No. 1037.

FROM THE MILITARY BOARD,

TO THE HONORABLE SIR C. T. METCALFE, BART.

Vice-President in Council.

HONORABLE SIR,

Fort William, 22nd February, 1831.

Transmitting copies of documents on the subject of the Canals under Mr. Prinsep's Superintendence; the majority of the Board recommend that the Circular Canal now constructing between Ballia Ghaut and Chitpore, should be carried on until finally completed; and that the Eastern Canals should for the present be discontinued, with slight exceptions. Lieut. Colonel Galloway is of opinion, that the whole undertaking has failed, and consequently recommends, that the work be entirely suspended.

We have the honor to submit, for the information of Government, a Copy of letters addressed to the late Canal Committee by Mr. James Prinsep, dated 15th September and 3rd December last, and of the annexed report, showing abstracts of expenditure* on the Canals under his Superintendence for the year 1829-1830, the progress made in their construction, and a sketch of what is proposed to be effected during the present season.

* On Mofussil Canals, .. 30,603 13 11½
On Circular ditto, .. 72,840 11 1½

Ra. 1,03,444 9 0½

2. Mr. Prinsep's report of the practicability of executing and maintaining, in a state of permanent efficiency, the series of Canals projected, by Major Schalch, at the head of the Sunderbunds, is by no means encouraging. The difficulty of preventing their Channels gradually filling up by the process of silting, and

in some parts, by the oozing upwards of the sandy soil, appears nearly insurmountable ; while the entrance of the tides into the Canals by the numerous rivers that intersect them, prevents the full benefit that was originally contemplated, by converting them into a series of Tide Channels, passable only at high water. So long, however, as each Cut will occupy a Boat nearly a tide in its passage, Mr. Prinsep considers, that this conversion of the Canals into tide passages, will be attended with no great disadvantage. It would appear from the Reports that the greater part of the trade has already been attracted into the new Channels, nearly 200 Boats passing Bamanghatta per diem, of all sizes, from the Dinghee to the 1,000 maund Pulwar, at the most unfavourable season of the year. Besides the diminution of danger to which native boats are exposed in crossing the great arms of the sea, there is a saving of time, to the extent of three days, as represented in Mr. Prinsep's letter of 3rd December, para. 7, though in his letter of 15th September, para. 25, he had estimated that there would be a loss of 12 hours for all boats of considerable draught using oars, in pursuing the new route.

3. On a mature consideration of all circumstances, the majority of the Board concur with Mr. Prinsep, in the expediency of discontinuing the prosecution of the Eastern Canals beyond the point they have now reached, and of leaving them in their present state, for a year or two, when a criterion may be formed of their success ; during which period, however, some expense may be advantageously incurred in the clearing and smoothing of towing-paths. A majority of the Board also concur with Mr. Prinsep in the expediency of carrying on the remaining part of the Circular Canal to completion, with the utmost vigour, being of opinion, that it would be highly inexpedient to discontinue the prosecution of that important Canal, which is already fast approaching to completion, and promises to be productive of permanent public advantages. By means of the Circular Canal, the Eastern Canal, the Channel through the Salt Lake and the Bamanghatta Canal, a free communication will be established between the Hoogley and the Soonderbuns by a new tract, and thus, an important part of the objects designed by the Canals (according to the Resolutions of Government of the 20th March, 1823) will be accomplished. We see no reason to doubt the permanency of the above extent of Canals, which are all already completed, with exception to a small portion of the Circular Canal ; and we think, great public advantage will result from the completion of that portion of the original scheme, even should the Canals to the Eastward of Bamanghatta entirely fail.

4. Lieut. Col. Galloway dissents from the opinion of the other members of the Board ; he considers the whole scheme to be in itself intrinsically defective, and to have entirely failed. Mr. Prinsep, indeed, has stated that " experience has long since proved that Capt. Schalh's scheme of a permanent line of Canal, &c. cannot be maintained in such a soil as that of the Soonderbuns, with sufficient depth for the Navigation of large boats, and that it must soon become a series of tide Channels passable only at high water," para. 22. Again, " I am by no means confident of the practicability of deepening such a soil in a permanent manner," para. 20. Further, " Still it must be confessed that nothing is gained in point of velocity (quickness of passage) by the new route, although one-third shorter," para. 23. " The tide Navigation of the line of Canals may be disposed of as follows—By the new Passage, hours, ... 34

By the old Route, hours, ... 22

" Hence it appears that there is a loss of a whole day in pursuing the new Route for all boats of considerable draught, yet capable of using oars, as Bauleahs, &c." Paras. 22, 24, 25 Report, 15th September. In his Letter of the 3rd December, however, Mr. Prinsep states—that " the wood boats from the Roymungul, told him that they saved three days in their trip ;" yet he adds, " I myself reached Huseinabad by the old route in 2½ flood and 2 ebb-tides, and returned by the new passage in 3 floods ;" thus himself, by experiment, finding

the time longer by the new route, instead of being three days shorter, as represented to him. Col. Galloway conceives, therefore, for the reasons assigned in his minute, that the work can in no way be made to realize the original intentions of Government ; that the Circular Canal is part of the original plan, and as such, has consequently lost its originally anticipated value, and that the very large outlay, amounting, it is believed, to several Lakhs of Rupees, still required for that part of the work alone, cannot be compensated by any advantage which its completion could yield, especially as the communication with the East side of the Town is already completed, and the passage to the Great River, existing by Tolly's Nullah, if cleared of boats, as it may easily be by imposing an additional Toll on such as remain in it beyond a given time allowed for passing, is better, more speedy, and otherwise preferable, to any that can be obtained by means of the Circular Canal, encumbered as it is to be by locks, and after all leading but a little way, till it must fall into the old route through Tolly's Nullah ; to say nothing of the possible danger of injury to the Navigation of the Hoogly, to the Drainage of Calcutta and to a portion of the Town from irruption of the river. He accordingly recommends, that the work be entirely suspended.

5th. The accompanying copy of the minutes recorded by the individual members of the Board, will better explain the views, which we have severally taken of this important work. We beg to submit them for the consideration of Government, and to solicit such orders as your Honour in Council may be pleased to communicate, for our guidance.

We have, &c.

<i>(Signed)</i>	T. ANBUREY, <i>Chief Engineer,</i>
„	A. GALLOWAY, <i>Lt. Col. Member Military Board,</i>
„	D. McFARLAN, <i>Chief Magistrate, & Mem. M. B.</i>
„	JOHN CRAIGIE, <i>Lt. Col. Mem. M. B.</i>

The accompanying original plans received with Mr. Prinsep's report above referred to, to be returned to this office, when no longer required.

(No. 16, to No. 25. inclusive, omitted.)

No. 26.

TO THE SECRETARY TO THE MILITARY BOARD.

SIR,

In compliance with the request contained in your letter of the 15th January last, I have the honor to forward, for the information of the Military Board, the accompanying two Statements, shewing the number of Boats, which have passed through Tolly's Nullah during the last official year from May, 1829 to April 1830.

I have the honor to be,

Sir,

CALCUTTA,
COLLECTOR'S OFFICE,
The 28th March, 1831.

Your most obedient servant,
(Signed) C. TROWER,

Collector.

No. 26. a.

*Statement shewing the Number of Boats, Donguhs, [? Dingees] &c.,
passed through Tolly's Nullah, for the Official year, 1829-30.*

	Number of Boats, Dun- gas, [? Dingees] &c., passed through Tolly's Nullah.	Amount of Tolls levied.	
May, 1829, ...	1,301	3,365 10 0	
June, ...	1,724	4,824 10 10	
July, ...	1,805	4,310 13 10	
August, ...	1,757	4,579 1 5	
September, ...	2,040	4,317 0 5	
October, ...	2,256	5,477 5 0	
November, ...	2,559	5,579 3 0	
December, ...	2,921	5,796 11 0	
January, 1830, ...	3,477	6,688 0 0	
February, ...	3 650	5,839 10 10	
March, ...	3,346	8,319 1 5	
April, ...	1,622	4,604 4 17	
Total Boats, ...	28,458	*66,401 7 2	* 763,701 7 2 —J. M.

CALCUTTA ; COLLECTOR'S OFFICE,
28th March, 1831.

C. TROWER,
Collector.

No. 26. b.

*Statement shewing the Number of Boats, laden with Firewood, passed
through Tolly's Nullah, for the official year 1829-30.*

	Number of Boats.	Quantity of Firewood as per koot.	Amount of Tolls.
May, 1829, ...	27	24,609	246 1 10
June, ...	107	1,90,500	1,905 0 0
July, ...	80	79,334	793 5 10
August, ...	101	1,16,474	1,164 11 15
September, ...	99	86,477	864 12 5
October, ...	130	1,05,439	1,054 6 5
November, ...	212	1,69,033	1,690 5 10
December, ...	212	1,55,635	1,556 5 10
January, 1830, ...	180	1,22,723	1,227 3 15
February, ...	251	1,73,629	1,736 4 15
March, ...	235	1,39,510	1,395 1 15
April, ...	241	1,29,832	1,298 4 0
Total Boats, ...	1,875	14,03,195	14,931 14 10

CALCUTTA ; COLLECTOR'S OFFICE,
28th March, 1831.

C. TROWER,
Collector.

(No. 27. omitted.)

No. 28.

No. 306.

To CAPTAIN GAVIN YOUNG,

Secretary to the Military Board.

SIR,

I had the honor to receive your letters, Nos. 1325 and 1403 of the 22nd and 29th March respectively, while in attendance upon Lt. Col. Tickell, Superintendent of Public Works, in his visit of inspection to the Mofussil Canals. We had, therefore, the opportunity of making personal enquiries on the points referred to us by the Military Board; and it was satisfactory to find, that the information thus gathered on the spot, agreed with the deductions already made.

First.—With regard to the number of Boats of various descriptions passing by the old Sundurbun and new Canal routes.

2. The accompanying statement No. 1, shews, that the average of Boats traversing the Bhamunghatta end of the Canal line from September to March inclusive, has been 177 per diem; this average at first sight appears very large; but it comprises a large proportion of the smallest description of saltees and dingees used by the fishermen and wood cutters,—one-third of the number, say 60 Boats per day, would more fairly represent the actual Navigation in Boats of burthen, passing the whole line of Canal.

3. Colonel Tickell and myself met several large Bhudrakhoolia Boats, returning from Calcutta to the Eastward empty, which, upon enquiry, proved invariably to be exploring the new Canals for the first time; which proves the utility of the route is hardly yet known to the generality of traders. The Koolna pilot, in attendance upon the Colonel's Budgerow, also, was not aware that it was Navigable for Boats of such dimensions. For the last month or two, the transit of Boats has been checked by the closing of the Bhamunghatta Cut, for the purpose of completing the excavations left unfinished last season; all these circumstances, would lead to the expectation of a considerable increase of the daily average hereafter.

4. Of the comparative navigation through the Tolly's Nala Route, I am unable to offer any correct information. Upon application to Mr. Collector Trower for a copy of the Toll Register of Tolly's Nala and of the Entallee Canal, I learnt that these documents* had already been laid before the Board, which will, therefore, be able to draw its own comparisons. I may beg leave to remark, that the Collector's Register may be expected to be *underrated*; while in the register kept by my people, the *contrary* error may possibly have been committed, from a misconceived desire to enhance the importance of the Canal Works. Should it be the desire of the Board to possess more accurate information on the subject, I will place trust worthy peons, at proper places, to keep registers for a month or other prescribed period.

Secondly. 5. The Board desire to know the comparative time occupied by boats of various descriptions using sails or oars, in passing by the Old and New routes. On this head, I beg leave to refer to the accompanying sketch No. 2, of the two routes from Calcutta to the Eshamuttee River, or the mouth of Good-lad's Creek. I have marked the points where, for moderate sized boats, it is necessary to pass at high water; and the run to be made with each ebb and flood, supposing there to be no wind, is expressed by dotted lines. The division of the Southern route admits of very little variation. Starting from Tarda with the ebb, boats of any dimensions are nearly sure of reaching Busuntpoor in two full tides: a light panswae, or good rowing boat, might even run down from the lake to Athara Banka

* See Nos. 26. a. and No. 26. b. at page xxi.—J. M.

in one ebb ; but (as we were informed by a panswace manjee who had performed this feat) it requires hard exertion at the oars.

6. Through Tolly's Nala, I presume, the only additional time required, setting aside all impediments from the crowded state of the Nala, would be *one flood tide* to run up to Gurryahat. Thus, as I stated in my annual report, three full tides will be sufficient for the old Sundurbun passage, and if favored by a westerly wind, it may be performed in two.

7. The Canal route, in ordinary circumstances, will occupy three full tides, because the strength of the tides is less, and in many parts, their direction opposes the progress of the boat ; because also, high water is necessary to enable boats of any draught exceeding one hath ($1\frac{1}{2}$ feet) to pass over the shallows of the Chullabarrya, Chytul, and Bayleygunj Canals ; one additional ebb is also required to perform the passage down the Eshamuttee to Good-lad's Creek, after reaching Hoseinabad—but this is equally demanded in the other route, since, although Busuntpoor is but a short distance above the mouth of Good-lad's Creek, the space can only be traversed with a falling tide, and the shoals, at the entrance of the Creek itself, would necessitate a detention there, until the return of the flood.

8. Boats of 900 maunds burthen, are now in the habit of passing through the Canal route eastward, in three full tides, without difficulty. Col. T's. Budgerow performed the return voyage in that time, taking the high water of the Bayleygunj Canal, as the starting point ; but there is this difference in the return voyage, that a tide must be lost by large boats in passing through the Hoseinabad Cut and Dansa Khal, at this season of the year ; since the lift of the Kullooar Gong tide, so far exceeds that of the Eshamuttee, as to produce a very strong current (east with the flood, and west with the ebb tides) through the Dansa Khal ; and there is, as yet, no tracking path along its banks to enable boats to stem it. They therefore pass the Hoseinabad Cut with the ebb, and anchor in the Kullooar Gong until half flood. The whole passage to Calcutta therefore occupies four tides in point of time : and to this might be added the flood necessary to bring the boat up the Eshamuttee, but as before remarked, this portion of time is common to both the Old and New routes.

9. With the assistance of a favorable wind, the time of passage may be very much curtailed, as the slackness of the Canal tide does not prevent progress being made against them. Thus I have traversed from the Mundaree Choumook to the Entallee Canal, in a Bauleah in one flood tide ; and I dare say the distance from Hoseinabad to Chytul, might be performed in a similar time, with an easterly wind : but it is hardly fair to lay any stress upon contingencies of such a nature.

10. Upon the whole, the Board will perceive that no time is gained under ordinary circumstances by the Canal route ; and that the advantages offered to navigation are, altogether, of another nature ; but I am not called upon, at present, to express my opinion upon any subject but that of the immediate questions referred to me.

I have the honor to be,

Sir,

Your most obedient Servant,

JAMES PRINSEP,

Superintendent of Canals.

CANAL OFFICE,
15th April, 1831.

No. 28. a.

No. 1.

Abstract of Boats Passing through the Bahminghatta and Bhogdiggee Canal, according to a Register kept at the Kanta Tullah.

Boats Passing to Calcutta.

	Large Boats above 300 mds.	Pansway Boats.	Dingee Boats.	Saltee Boats.	Total.
1830.					
Sept.	391	367	1596	311	2665
Oct.	601	449	1945	549	3544
Nov.	537	533	1349	426	2845
Dec.	631	644	1578	566	3419
1831.					
Jan.	518	546	1252	601	2917
Feb.	319	378	483	599	1779
March,	371	502	550	666	2089
	3368	3419	8753	3718	19258

Average of Boats per month, ... 2751
Ditto per day, ... 91

13th April, 1831.

XXIV

Boats Passing from Calcutta.

	Large Boats.	Pansway Boats.	Dingee Boats.	Saltee Boats.	Total.	Grand total.
	619	410	1368	306	2703	5368
	356	248	852	229	1685	5229
	670	511	1462	658	3301	6146
	625	695	1663	609	3592	7011
	462	562	1144	618	2786	5703
	317	419	496	656	1888	3667
	355	661	526	659	2201	4290
	3404	3506	7511	3735	18156	37414

Average of Boats per month, ... 2593 Average per month, 5344
Ditto per day, .. . 86 Ditto per day, 177

JAMES PRINSEP,
Superintendent Canals.

(No. 29. to No. 33. inclusive omitted.)

No. 34.

No. 2781.

FROM LIEUT. COL. R. TICKELL,

Superintending Engineer, Lower Provinces.

To CAPT. G. YOUNG,

Secretary Military Board,

SIR,

Barrackpore, 19th April, 1831.

In compliance with the instructions of the Military Board, communicated in your letter* No. 363 of the 13th [18th] of January last, respecting the new line of Canals from the Esamutty River at Hoseinabad to Calcutta, I returned by that route to the Presidency for the purpose of inspecting it, accompanied by Mr. James Prinsep, who met me by appointment near Bissuntpore, on the evening of the 1st Instant. I had a large 16-oared Budgerow, drawing about three feet, and three office and baggage boats of 6 or 700 mds. each.

* See Index to Appendix to Appendix (H.) No. 3.

2. One tide is sufficient to take up a Boat from Bissuntpore, at the western extremity of Goodlad's Creek, to the entrance of the Bayley Gunge Cut, or by the old route through the Roymungul; but having been delayed nearly 3 hours at Bissuntpore, in endeavouring to extricate our grapnel, which had caught in a sunken boat, I did not reach Hoseinabad, the entrance of the new line of Canals, until 8 A. M. on the 2d, at about half ebb, which however carried us down, in the course of an hour, to the mouth of the Bayley Gunge Cut; the latter half of the ebb, running West through the Hoseinabad Cut and Dansa Khal.

3. About 9 A. M., reached the mouth of the Bayley Gunge Cut, the bed of which we found nearly dry, and remained there till 1 P. M., about $\frac{3}{4}$ flood; and proceeded at 2 P. M. through the Bayley Gunge Cut; and at $\frac{1}{2}$ past 2, entered that of Bowanypore, current against us, and obliged to track at 4 P. M. through this Cut; and the current being now slack, and no tracking ground, proceeded by luggeis, until $\frac{1}{4}$ past 5, when we entered the Aktratollah Khal with the tide in our favour, and at $\frac{1}{2}$ past 6 P. M. reached the end and anchored.

4. At 12, the same night, proceeded, and at half past 1 A. M. of the 3rd, stopped at the entrance of the Chytul Canal, the bed of which being high, we were obliged to remain there until $\frac{3}{4}$ flood or nearly so, when we proceeded at $\frac{1}{4}$ past 5 A. M.; got through in the course of an hour, and dropped down to Basserah or Choumoah at the Mundaree Khal, and waited there until 12 for the flood. At 4 P. M., entered the Chultabaryah Cut, which we got through at 7; at $\frac{1}{2}$ past 9, turned down the Kanta Khal, the Bominghutta Canal being closed for the purpose of completing the excavation, and at 11 P. M. reached Tordah, where we remained for the flood; and about 1 A. M. on the 4th, proceeded up the lake, and reached Ballyaghat at 5 A. M.; having thus made the passage in two days and a night, or nearly 60 hours, which, by all accounts, is about the same time that we should have taken by the old route through the Roymungul, that is, as far as Tordah, whence the passage through Tolly's Nullah would of course prove much more tedious than that up the Lakes, in consequence of its being always so much crowded with Boats.

5. With reference to the 3d paragraph of your letter under reply, I shall now proceed to describe the actual state of the new line of Canals, with reference to facility of Navigation, both for light and heavy Craft.

6. HOSEINABAD CUT.—The shallowest part of this Cut, is at the entrance towards the Esamutty over the remains of the Old Bund, where it is scarcely 2 feet deep, I understand, at low water; my boats, however, passed without difficulty, and we found from 6 to 7 feet water beyond it.

7. The ebb and flow are regulated by the Kulloar Gung, in the same manner as are the rise and fall of the Tide in all the other new Cuts, by the several Tide streams that intersect them, and which serve alternately as feeders and drainers, leaving the beds nearly dry in many places at low water, and at high water, affording ample depth for the passage of Boats of from 800 to 1,000 mds.

8. The velocity of the current in the Dansa Khal, exceeds that of any other point in the line, being between 5 and 6 miles an hour; sufficient to prevent any filling up. One or two stumps of trees require to be removed, and for which Mr. Prinsep gave the necessary orders on the spot.

9. The Board are fully informed of the unsuccessful attempt that was made in 1829, to bund off the Kulloar Gung, with a view of conducting the powerful ebb current which passes down the Hoseinabad Cut into the Bayley Gunge Canal, and which would have effectually prevented any deposits of silt in either. The Board are also in possession of Mr. James Prinsep's Reports as to the expediency, or otherwise, of making another attempt, the advantages of which, he appears to think, would not prove commensurate with the difficulty and expense of such an undertaking, and recommends that the new Navigation be allowed to remain as at present, a system of tide passages—at least for a year or two, when a fair criterion may be formed of its success; in which opinion, as well as I can judge from the little I have seen of the Canals, I fully concur; for the new line under any circumstances, I conceive, will only be adapted for light craft, that is, for boats not exceeding 1,000 mds. tonnage.

10. **BAYLEY GUNGE CANAL**—The sandy spit or ridge in the centre, is completely dry at low water, and the Eastern extremity nearly so, which was not excavated last season to the full depth by 2 or 3 feet;—at high water, however, there is always a depth at the shallowest part of 6 feet, sufficient for the passage of boats drawing not more than three Hots. Several stumps of trees in the Hinchee Khal to the Westward, are now being removed, and the tracking path continued down to the mouth of this Khal.

11. **BOWANY GUNGE CANAL**—Like the former, is shut up, at low water, the ridge of sand in the centre, being then left dry. The Bayley Gunge and Bowany Gunge Canals being so near each other, Boats can easily pass through both, with one flood Tide; the current in the latter is slack, tracking therefore becomes necessary at all times.

12. **CHYTUL CUT**—Has deepened considerably since it was opened, from the strong set of the Seeoldah Gunge Tide through it; and although it was never fully excavated, it does not appear necessary in consequence, to incur any further expense in completing the intended section; it is of course dry at low water in the centre, and like the Bayley Gunge and Bowany-pore Canals, can only be passed at $\frac{3}{4}$ tide, or high water, when there is a depth of from 7 to 12 feet. From the position and distance of this Canal from those to the Eastward, and the loss of more than half a tide in passing through the Bayley Gunge and Bowany-pore Cuts, a separate flood tide must be devoted to this passage, for all, except very light boats, and nearly a whole ebb Tide is consumed in running down a distance of only $1\frac{1}{2}$ miles to the Mundaree Khal or Choumoah.

13. **CHULTABARYA CANAL**—Forms the Western extremity of a series of natural Khals running from the Choumoah, and can therefore be reached in one flood tide; a boat here brings the tide with it, and the tracking path admits of its being carried on through the slack water, till it finds the ebb at the Doodbeebe Khal, which carries it to the mouth of the Bojdiggee Canal—these three form, in fact, but one Canal. There are several shallows in the artificial Cuts which are dry, or nearly so, at low water—one in particular, which was caused last rains by a sledge of the banks to the extent of about 500 feet, a little to the West of Bunjur Haut. The removal of this impediment would of course render it necessary to close the navigation of the new line for a month or six weeks, but there being still a depth here of $4\frac{1}{2}$ or 5 feet at high water, it does not appear necessary, at present, to incur any further expense

on it. From the Choumoah to these shallows, is a distance of 12 miles, which perhaps is too long a run for deeply laden craft; this disadvantage, however, is partly obviated by the power of applying the Goon, as it lies through a country free from jungle, and from the length of the line, the rise and fall of the tide is reduced about 3 feet, which maintains, it is said, a sufficient depth of water to keep Boats drawing 2 Hots afloat, during low water, except at the places above mentioned; no Boat therefore of larger draft should attempt to pass, unless sure of making its way through in one tide. The Doodbeebee Khal, in the centre of these Canals, and bunded as it is from the access of the tide from below, forms a convenient reservoir, or feeder to the Chultabarya and Bhojdiggee Canals, and is the main cause of the little difference of the tide level observable in them.

14. **BAMINGHATTA CANAL**—This is now closed for the purpose of completing the excavation of last year at the East end. The section of this Canal, Mr. Prinsep states, has hitherto suffered nothing, having indeed been only open for one season; it was observed that previous to closing it, the tide set through from the Kantatalla, so that one cause of its expected deterioration is thus removed, but the current is very sluggish, and the water of the Sunderbund Creeks, both here and throughout the whole line of the Canals to the Esamutty, abounds with silt, contrary to the expectations at first entertained.

15. The Channel through the Lakes, appear to maintain ample depth for boats of all sizes, and indeed by a natural operation, it deepens in section, and the rapidity of the current increases in proportion as the banks or bunds on its sides, become covered with vegetation.

16. I observed that the mouth of the Eastern Canal at the upper end of the Lake was much blocked up by a deposit, which, I was informed, proved too hard for the dredgers at work in this Canal; and it may perhaps be necessary to excavate this by bunding and chowka work. I have accordingly called on Mr. Prinsep for a plan and estimate.

17. From the foregoing observations, the Board will perceive, that the new line of Canals is adapted only to the navigation of light* boats, to which it affords, I conceive, a communication preferable to that by the old route through the Sunderbunds—in the first place, by avoiding the Roymungul and other dangerous points of the lower Channel; secondly, the small depth of water in which they would be immersed in the event of meeting with an accident, so that the boat and cargo are comparatively secure; and thirdly the frequent occurrences of cultivated country and villages on the line, instead of the continued jungle, which is met with along the old route.

18. In point of time, little or nothing, is to be gained except perhaps by boats which can row against tide, the ebbs and floods being all much more gentle than in the great Sunderbunds; the time of transit therefore, may be considered on a par with that of the lower line, although the distance traversed is so much shorter.

19. The line of Sunderbund Canal is open both to Tolly's Nulla and the Lake exit, and so far may be considered apart from either of these. The preference must be given to the Lake route by fish boats, and all in fact, bringing goods to the Calcutta market, as it will enable them, by means of the Eastern and Circular Canal, to land their cargo in the very Town. The remainder, including heavily laden boats, resort to Tolly's Nulla, I conclude, either for the purpose of passing through into the Hoogly, or to deliver their freight in the neighbourhood of that stream; the Eastern Canal not affording, at present, a sufficient depth of water for the larger boats. But it is impossible, as yet, to judge which of the two routes will be most frequented, until the Circular Canal is completed and opened to the river; when it is but reasonable to expect, that the new one will attract most of the craft now

* That is, Boats up to 1000 mds. burden—but Boats used in the transport of the produce of the Country, will adapt themselves to the circumstances of the Navigation, in the same manner, as smaller vessels came more generally to frequent the Port of Calcutta in preference to larger vessels, as being more suitable to the Navigation of the Hoogly, and the Commerce of the Country.—J. M.

passing through Tolly's Nulla, which will then most probably be used only during the period of the rains, when the Chitpore Locks will be closed against the Navigation for two or three months.

20. Having thus briefly noticed the various impediments that exist in the several new cuts, there remains but little further to be said of the facility of navigating through them along the new line, which appears to be as fully and freely navigable now, as it can well be made, for the passage of boats not exceeding 1000 mds. burthen; and by the registers kept by Mr. Prinsep, it seems to be used and preferred by them; it is consequently, so far, of considerable public utility, and the expense of maintaining it so, does not promise to be incommensurate with such a beneficial result.

I have, &c.

(Signed)

R. TICKELL, *Lieut. Col.*
Superintending Engineer, Lower Provinces.

No. 35. and No. 35½. omitted.

No. 36

No. 316.

To CAPTAIN GAVIN YOUNG,

Secretary to the Military Board, &c. &c. &c.

SIR,

I have the honour to acknowledge receipt of your letter No. 1720, dated 21st ultimo, informing me that the Estimate No. 332, for deepening the Balya Ghat Canal, had been passed by Government.

2. The advanced state of the season will oblige me to postpone this work until after the rains, as it would be very inconvenient now to close the Dhurmtulla drains.

3. In anticipation of the Board's orders, I have cleared away the deposit from the mouths of the Bythukhanah and Narkooldungah drains, and I have further to report, that, the Canal is now open to the drainage of the town as far North as the Ultahdungah division. I subjoin for the information of the Board, a table of the levels of the several Drain-floors referred to the zero or average level of the Salt Water Lake, as fixed by the late Superintendent.

4. Through the unskillfulness of the head bricklayer, some of the Drains at first constructed, were made higher than I intended, but as they all allow a sufficient slope from the Circular Road Drain floors, I have not thought it necessary to alter them.

I have the honour to be,

Sir,

Your most obedient Servant,

OFFICE : SUPERINTENDENT CANALS,
4th May, 1831.

JAMES PRINSEP,
Superintendent of Canals.

No. 36. a.

Levels of the Town Drains towards the Circular Canal, above or below the Lake zero.

Name of Drain.	Level of Sill or Floor.		Slope of the floor of the Tunnel drains.		Slope from the Circular Road to the upper mouth of the Tunnels.		Fall from the Circular Road drains to the zero or average level of the Canal.				
	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.			
<i>Bytukkaneh Drain—South.</i>											
Sill of Masonry at the Circular Road, ...	+	5	9 $\frac{1}{4}$	..	..	}	5	4			
Ditto mouth of Tunnel, ...	+	0	5 $\frac{1}{8}$	}	4		8 $\frac{2}{3}$	}	5	9 $\frac{1}{4}$	
Ditto discharge of ditto in Canal, ..	—	5	2		..		..				
<i>Bytukkaneh Drain—North.</i>											
Sill of Masonry Circular Road, ..	+	5	8 $\frac{1}{4}$	..	..	}	4	1	}	5	8 $\frac{1}{4}$
Ditto mouth of Tunnel, ...	+	1	7 $\frac{1}{2}$	}	5		7 $\frac{1}{2}$	..		..	
Ditto discharge into Canal, ...	—	4	0		..		..				
(curved to	—	5	5)								
<i>Narkuldungah Drain—South.</i>											
Sill at Circular Road, ...	+	2	3 $\frac{3}{4}$	..	..	}	0	6	}	*2	3 $\frac{3}{4}$
(Soil filled in 1 $\frac{1}{4}$ feet above Sill,)							..	...			
Mouth of Tunnel Drain, ...	+	1	10	}	3		4	..		..	
Discharge of ditto, ...	—	1	6 $\frac{1}{2}$		..	..					
<i>Narkuldungah Drain—North.</i>											
Sill at Circular Road, ...	+	1	4 $\frac{3}{4}$	..	..	}	0	3	}	*1	4 $\frac{3}{4}$
(Soil filled in 2 feet above Sill,)							..	..			
Mouth of Tunnel, ...	+	1	2	}	1		4	..		..	
Discharge of ditto, ...	—	0	2		..	..					
<i>Maniktola Drain—South.</i>											
Sill at Circular Road, ...	+	3	1 $\frac{1}{2}$	..	..	}	3	6	}	3	1 $\frac{1}{2}$
(1 foot of Soil above hard earth,)							..	..			
Mouth of Tunnel, ...	—	0	4 $\frac{1}{4}$	}	2		3	..		..	
Discharge of ditto, ...	—	2	7 $\frac{1}{4}$		..	..					
<i>Maniktola Drain—North.</i>											
Sill at Circular Road, ...	+	3	4	..	..	}	1	10	}	3	4
Mouth of Tunnel, ...	+	1	6	}	1		11 $\frac{1}{8}$	..		..	
Discharge of ditto, ...	—	0	5 $\frac{1}{8}$		..		..				

Here in the rains the tide in the River rises as high as the road.

Here in the rains the tide in the River rises as high as the road.

At Ooltadanga the River rises, 1 $\frac{1}{4}$ feet higher than the Circular Road Street.—*Captain Schalch's Memoir.*

* The real slope of these Drains is greater by two feet; the Sill of the Circular Road drain bridge being unnecessarily deep.

J. PRINSEP,
Superintendent Canals.

No. 37. a.

No. 318.

FROM JAMES PRINSEP, ESQ.

*Superintendent of Canals.*TO LIEUT. COL. TICKELL, *Engineers.**Superintendent of Public Works, &c. &c. &c.*

SIR,

Calcutta : 5th May, 1831.

I feel at some loss to answer your reference, under date the 22d ultimo, regarding the relative advantages of the new Mofussil Canal routes, from my having devoted but little attention to the subject, beyond what might be necessary in the course of my operative duty, of bringing the several works to completion. The expediency, or otherwise, of Major Schallch's scheme, I looked upon as already set at rest by the former opinions of experienced officers and the determinations of Government, founded upon them.

2d. Against the success of such a scheme, it might have been argued at first, that a free and commodious water passage already existed through the Sunderbuns, possessing the facility of tide-ways, with an ample depth of water, not liable to diminution by deposit, and having merely the inconvenience of passing through deep and dangerous jungles, in which the frail boats of the country, were occasionally exposed to accidents.

3d. The traffic by this route had, for a long period, been very considerable, in spite of these dangers, so great as to yield a large revenue to Government, through the Toll at Tolly's Nullah. If the new cuts were proposed to add to the security and facility of this extensive navigation, apart from any view of actual pecuniary benefit, this object has certainly been gained; the total expenditure upon them, being,* in fact, a trifle compared with the revenue already derived from Tolly's Nullah and the Entallee Canal.

4th. In point of speed, the result has proved, that no advantage should have been calculated upon; especially, while the route eastward of the Juboona, lay through Good-lad's Creek; and from Major Schallch's Memoir, it does not seem, that he set much upon changing that route, which he states to be very commodious, and not to have deteriorated since it was first opened.

5th. But the security to light craft (and to boats from the up country in particular) from travelling through water, so much more tranquil, and of less depth than former Channels; affording also, commodious tracking paths, and ground for making fast at night, instead of being obliged to anchor in the middle of impetuous streams; and last, though not least in real utility, the convenience of meeting with villages and markets throughout, are positive advantages of the new route, to which those engaged in the navigation are becoming every day more sensible.

6th. The distance to be travelled, is likewise much curtailed, although the passage may occupy the same, or even a longer interval, than that by the lower Creeks; it is also, for a considerable distance, nearly straight, so that when the wind is favourable, progress against tide is more facilitated, than it would be from the same cause below.

7th. The points of communication with cultivated country, are also multiplied, so that the produce thereof, may be shipped and brought to market at a cheaper rate than heretofore; and it may fairly be expected, that the opening of the Canals, will accelerate the clearing of all the jungle lands, lying any where contiguous to them.

8th. Judging from the registry of boats passing through the new Canals, their success might be pronounced complete, and *ceteris paribus* what other test could be imagined of so

Rs. 2,00,000.

practical and conclusive a nature? But there is this difference, between the two routes, viz.—that the new one has cost two lacks of rupees: to make a fair comparison therefore, a Toll, equivalent to this outlay, should be established, and the number of boats then registered and compared with the present rate.

9th. It is hardly good, in argument, to assume that a Canal must be useless where river conveyance is to be had close by. I need not call to your remembrance the opinion current among Engineers in Europe and quoted by Mons. Dupin,—“*that rivers were but created to become feeders to Canals, at least in an advanced state of civilization.*” This view of the question is not quite suitable to the Canals of the Sundurbuns; it would be more so, were the present series of tide-ways cut off from the Sundurbun streams, by powerful bunds: and I have already expressed my opinion to the Board, that the system of short cuts would be materially improved, by transforming them into one or two continuous Channels, which would give them more of the condition of a real Canal; but it remains a question, whether, this or any other expensive measure, could be compensated by pecuniary benefit to Government; and this is the ground upon which I have ventured to recommend, that the further extension of Major Schaleh's scheme should be suspended.

“Force commercial, de. G. B.”

10th. That there are advantages from the Mofussil works, even in their present state, I hope, I have succeeded in proving; while I have granted, not only, that they were far from being indispensably necessary, but even far from fulfilling the expectations of their originator. They are too much effected by the rise and fall of the tide; they are *liable* to choke up gradually from sand-oozings, deposit of silt and sliding of banks; they throw the salt-water of the Sundurbuns upon the cultivated land of Chultabarya, and render* the formerly sweet water of the Juboona unfit for irrigation; they cannot be made into a single Canal line, on account of the vast depth of the Mundaree Choumooh; or into two lines, without the expensive measure of bunding the Kulloor, Gobra, and Kantatulla streams.

11th. On the other hand, they have opened a convenient passage through cultivated country; they are finished as far as they go; they have not cost much; and they will remain serviceable for a long time at a trifling occasional expense.

12th. I believe I have brought forward, impartially, all of the arguments which strike me, for or against, the Mofussil Canals, and I do not conceal, that my opinion is opposed to the principles advanced by their originator. The new cuts do not stand in the same light as the Coxalee Khal or Good-lad's Creek, or as Morrison's cut in the Burra Kooleya. Both of these shortened and improved the eastern route wonderfully; and Tolly's Nullah did so in a more especial manner, by opening the connection with the Hoogly so close to the metropolis.

13th. I concur fully in Mr. Schaleh's observations on the subject of the latter Channel, which is certainly not adequate to cope with the augmented inland traffic of the port.

14th. A second and more commodious communication was called for, and setting aside the cost of the land, no site could have been more judiciously chosen, than that of the present *Circular Canal*; but this question is distinct from the subject of your present reference.

I have, &c.

CANAL OFFICE:

5th May, 1831.

(Signed) J. PRINSEP,

Superintendent Canals.

(True Copy,)

(Signed) R. TICKELL,

Superintending Engineer, L. P.

* The opening of the Hoseinabad Canal into the Essamuttee River, must have had the same effect on the water of that River, as the opening of the Circular Canal has had on the water of the River Hoogly, which has not been attended with the serious evil as was at one period apprehended.—J. M.

No. 38.

Minute by LIEUT. COLONEL GALLOWAY, on the Papers marked No. 36. and No. 36. a. of this Appendix.

It appears by this report of Mr. James Prinsep on the drains opened into the Circular Canal, dated the 4th instant, that only the drains of three streets, viz.—Bytuckhana (or Bowbazar Street), Narkeldanga, and Manicktollah, have as yet, been opened into the Canal.

It also appears, that at the Circular Road, the bottoms of the Calcutta drains are in level, above the Salt Water Lake, as follows ;—

				Ft.	In.
Bytuckhanah,	{	South drain above the Lake,		5	9 $\frac{1}{2}$
		North	Ditto Ditto,	5	8 $\frac{1}{2}$
Narkeldanga,	{	South Ditto Ditto,		2	3 $\frac{3}{4}$
		North	Ditto Ditto,	1	4 $\frac{3}{4}$
Manicktollah,	{	South Ditto Ditto,		3	1 $\frac{1}{4}$
		North	Ditto Ditto,	3	4

If these levels be correct, it is manifest that by admitting the River into the Canal to the above heights, respectively, an entire stop commences to the drainage of Calcutta by these drains. But in the rains we know, that the River rises more than 12 feet above the Lake, and consequently, upwards of 6 feet above some, and about 9, 10, 11 feet above others of those drains ; and that in the rains, the River instead of being as high as the sills or bottom of the drains at the Circular Road, at the Bowbazar, the River if let in, would rise as high *as the street itself* ; and at Ooltadanga the River *rises* 1 $\frac{1}{2}$ feet above the Circular Road street.—*Captain Schalch's Memoir.*

It appears, Mr. Prinsep states, that through the unskillfulness of the head Bricklayers, some of the drains at first constructed, were made higher than Mr. Prinsep intended ; of these drains, I observe, some are made to discharge their contents into the Canal on a level with the water in the Canal, when that is equal with that of the Lake, some upwards of 5 feet below that level.—I cannot help expressing my surprise and astonishment, that a matter of so great importance, as the construction of drains on which the health and comfort of the inhabitants of this city so materially depend, should have been left either to the skill or unskillfulness of any such person as a head Bricklayer. It is impossible that the board, can rest satisfied with such a report as this: I propose therefore, that Government be requested to assemble a Committee of Engineer Officers and others, who may have a knowledge of the drainage of Calcutta, to examine and report on those drains ; and upon the effect which the Circular Canal is likely to have on the drainage of the city ; and to point out what means they may deem most advantageous, for securing at all seasons of the year, if practicable, that indispensable object.

16th May, 1831.

(Signed) A. GALLOWAY.

No. 38½.

[Minute by D. McFARLAN, Esq. Dated 16th May, 1831, on the Papers marked No. 36 and No. 36. a.]

I do not think it will be necessary to apply for a Committee, though there can be no objection whatever, to send the communication noticed, to Colonel Tickell for report.

In Mr. Prinsep's letter, there were two points that seemed to require my attention as Chief Magistrate—one, whether it would be necessary to lower the mouth or Western end of the Tunnel emptying itself into the Canal on the North side of the Nurkeldanga Road ; the other, whether the floor of that drain at the Circular Road was too low or not.

I need not trouble the Board with the lengthened enquiry this has given rise to, especially as the two points are not yet completely settled. I am pretty confident, however, that the sill of the drain alluded to by Mr. Prinsep, cannot be safely raised, and the floor of the Tunnel will have to be lowered, not as a matter of necessity but of convenience and expediency.

The fears mentioned in Colonel Galloway's Minute, are founded upon the assumption that the River water is to be let into the Canal.—But that is not intended, except in such regulated quantities, as may, from time to time, be considered desirable for the purpose of causing a current through the Canal.

Supposing we have locks for the transit of Shipping* at all times, the quantity of water let into the Canal at any given time, would be so small, as when spread over the whole length, not to be sufficient to rise the general level in any important degree, which again would be soon compensated by water let out of the Canal, as Craft passed into the River.

The Canal has not interfered with the Marhatta Ditch to the North of Mutchwa Bazar Road.

(Signed) D. McFARLAN.

No. 39.

No. 299.

TO THE HON'BLE SIR C. T. METCALFE, Br.,
Vice President in Council.

HONOURABLE SIR,

We have the honour to submit for the information of Government, the annexed copies of Reports* by Lieutenant Tickell and Mr. J. Prinsep, dated the 15th and 19th ultimo, and 5th instant, communicating further particulars relating to the construction of and the advantages derivable from the Circular and Mofussil Canals.

2. With reference to an observation at the close of the 19th Paragraph of Lieutenant Col. Tickell's Letter, as there appears to be some misapprehension, we shall draw his particular attention to the Plan of "Gates" proposed by the late Captain Prinsep in his Memoir of October 1827, and request him to consider in concert with Mr. J. Prinsep, whether that Plan still appears preferable to any other,* and whether a system of Canal locks, and admitting of the egress and ingress of Craft from and to the River at all times, might not be devised and carried into effect without materially enhancing the cost of the work.

3. On receipt of his reply, we shall again address Government on this point.

We have, &c.

(Signed) THOMAS ANBURY, Col., Chief Engineer.
,, A. GALLOWAY, Lt. Col., Mem. Military Board.
,, D. McFARLAN, Chief Magistrate, & Offg. M. M. Bd.
17th May, 1831. ,, JOHN CRAIGIE, Lt. Col., Mem., Military Board.

* Sic original.
J. M.

* See Nos. 28, 34,
36, 37, a.

* See Index to Appendix to Appendix (H) Nos. 41, 86, 95, a, 97, 98, 99, 99, a, 99, b, 99, b½, 102, 103, 104, 105, 106, 108, a, 148, a, 150.

(No. 40 to No. 53 inclusive, omitted.)

No. 54.

To JAMES THOMASON, ESQ.

Deputy Secretary to Government—Judicial and Territorial Department.

SIR,

We have the honour to report that the progress of the excavation of the Circular Canal is about to obliterate some portions of the old Marhatta Ditch or Chitpore Nulla, laid down as the legal boundary of the Town under a Government Proclamation,—an Extract of which accompanies, and the verbal description of which as relates to the present subject, may be said to be between the mouth of the Nullah and the Bridge at the commencement of the Dum-Dum Road, as is shewn in the accompanying sketch.

2nd. It appears to be very desirable not only that what is the actual limit of jurisdiction should not be uncertain and undiscoverable, but that it should not be a fictitious line or a mere line on paper, but something substantial, not liable to pass out of men's memories or to be insensibly encroached upon by neighbouring inhabitants. Hitherto the Marhatta Ditch has been an excellent limit, but when parts of it are filled up, it can no longer afford the same security that embarrassing legal questions may not arise regarding the actual limit of the Town.

3rd. To provide against this eventual inconvenience, any of the [following] three Plans may be adopted—1st. A wall may be erected on the site of the old boundary—2nd. Small drains may be kept up, shewing the old Channel—or 3rd. The jurisdiction may be extended to the Canal: we shall say a few words in a general way, upon these plans.

4th. The old Chitpore Nullah or Ditch being no longer required for a drain, becomes the property of Government, and so much of it as borders on the ground already bought for the Canal, may of course be annexed to that ground, and disposed of in common with it: what is not contiguous may be sold to or exchanged with the nearest proprietor, but if the ground were thus given up to private individuals it would be essential to secure the permanence of the boundary. Nothing short of a wall or a ditch or drain to be considered a public work, would secure this object; for supposing one individual to purchase the land on both sides of the line, what authority would there be to prevent him building over the line, and effectually confounding the limit.

5th. It is to be considered, however, whether Government would build a wall, or order a smaller ditch to preserve the present Northern boundary, or extend the jurisdiction at once to the Southern bank of the new Canal, under the provisions Chap. 84, of the 55 Geo. III.: were the latter course followed, nothing would be required to be done to preserve the memory of the Marhatta Ditch or Chitpore Nullah; individuals would take care of their own boundaries.

6th. There would be other advantages in that course, the Canal would be a much better public boundary, both for purposes of Police and for the prevention of Smuggling, the small strip lying between the Canal and the ditch would be an awkward adjunct of the Chitpore Thanna.

7th. In considering of this question, it is however proper to mention that there is, as indicated in the accompanying sketch, a small strip of land, the property of Cassinauth Gangolee,* which would thus be brought within the limits of the Town, but the spot is extremely limited, and we have learnt in a general way, that the proprietor will not object to this ground being made subject to the jurisdiction of the Supreme Court.

8th. We have communicated with Mr. Master, who sees no objection to the latter arrangement.

* NOTE.—The Spots noted as being the property of Madhub Soor & others have been purchased by Government.

9th. A reference to the sketch will shew that if a wall be built, it will be a crooked boundary, and somewhat expensive: it might be dwarf, say 3 feet high, the mere purpose of a public boundary, but it would need to be higher if considered as a barrier.

10th. As against the plan of extending the boundary, we should mention the objection that it would subject part of the godowns about to be erected upon the banks of the Canals, to the jurisdiction of the Supreme Court, which whether an evil or a good, would be inconvenient as placing one portion of the Mercantile Community frequenting the Canal under a different system of law and judicature from the remainder.

11th. It is to be considered also, that there must apparently be provided Drainage for the proportion of ground lying between the edge of the Canal and old jurisdiction of the town. The banks of the Canal will necessarily be raised, and the shed [? flow] of water will be Southward, and may be inconvenient unless an outlet be provided on the site of the old ditch; and it would be quite possible to fill up the ditch to a great extent, and yet leave a superficial conduit for drainage. Thus the old bridge at the commencement of the Barrackpore Road may be taken as the apex or highest point:—Surface Drains might commence there, leading Southward to the Canal and Westward to the River, both deepening as they reach the ultimate point.

12th. Upon the whole, this last will probably be the better plan, though indeed it will not be so economical as that of extending the boundary, seeing the site of the present Marhatta Ditch will require to be kept free for the maintenance of the new Surface Drain. It will moreover be no security against Smuggling.

13th. We have thought it necessary to enter into this detail, because we are the natural conservators of the boundary, which is unquestionably about to be seriously affected by the progress of the Canal, and has already been so, and because we feel, that in a choice of plans so nearly balanced in respect of their advantages, the decision of Government is necessary.

We have the honor to be, &c.

(Signed) D. McFARLAN, Chief Magistrate.

„ W. C. BLAQUIERE, Magistrate.

„ P. ANDREW, Magistrate.

CALCUTTA POLICE OFFICE, „ A. S. L. McMAHON, Magistrate.

2nd Nov. 1831. „ C. K. ROBISON, Magistrate.

No. 54. a.

Extract from the Proclamation relative to the Limits of the Town of Calcutta, dated 10th day of September, 1794.

The Northern Boundary is declared to commence, and does accordingly commence, on the West* side of the River Hoogly at the Post or Mete No. 22. Situated at the North Point of Colonel Robertson's Garden, called Jackapore, immediately opposite to the North of the Brook called Chitpore Nullah or Baugbazar Nullah, and the said Northern Boundary is from thence declared to continue and is continued accordingly by a line drawn across the River from the aforesaid point to the South corner of the mouth of the said Nullah into the Post or Mete No. 1, near the foot of the Chitpore Bridge, and from thence by a line drawn Easternly, and passing the South end of the said Bridge to No. 2, and from thence along the South side of the said Nullah or Brook to the Post or Mete No. 3, and thence into the Post or Mete No. 4, passing the Old Powder Mill Bazar, until it reaches the foot of the Bridge leading to Dum-Dum where the Post or Mete No. 5 is.

[? * East.]
J. M.

(Signed) D. McFARLAN, Chief Magistrate.

(True Copies.)

(Signed) H. C. WATTS, Head Clerk and Accountant.

No. 55.

(No. 1687,)

To D. McFARLAN, ESQ.

And the other Justices of the Peace for the Town of Calcutta.

Judicial Department.

GENTLEMEN,

I am directed by the Honorable the Vice President in Council to acknowledge the receipt of your Letter, dated the 2nd instant, on the subject of the Northern Boundary of the City of Calcutta.

2nd. To remedy the inconvenience which might result from the obliteration of the Marhatta Ditch forms the present Northern Boundary, and is on the point of being filled up by the earth excavated from the new Circular Canal, you propose one of three expedients.

First,—That a wall be erected on the site of the old Boundary.

Second,—That small Drains be kept up shewing the old Channel of the Marhatta Ditch.

Third,—That the Canal be constituted the future Boundary of Calcutta.

3rd. To the latter course several objections exist, to one of which yourselves have adverted in Paragraph 10 of your Letter, independently of these, the measure to be effectual should be immediate, whereas the course in question under the terms of the Act of Parliament (Chap. 84, of the 55 of George III.) requires the sanction of the Court of Directors and Board of Commissioners, and therefore involves the delay of a reference to them.

4th. From Paragraph 4 it would appear, under any circumstances Drains are requisite either on the site or in the immediate vicinity of the present Marhatta Ditch. The construction of a wall is not therefore an alternative proposition, but if authorized at all, must be additional to the Drain.

5th. The terms of the Proclamation appear to the Honorable the Vice President in Council to point out the most convenient method of marking the Boundary. A Drain may be constructed as nearly as possible identical with the present Boundary, and Posts or Metes erected at the points where they formerly stood, or if they are obliterated, as near the old site as can now be ascertained, or at such points as are most convenient, so that straight lines may be drawn from one post to another. For durability, the Posts or Metes should be constructed of masonry and distinguished by appropriate inscriptions, marks or numbers.

6th. For the execution of this measure, His Honor in Council is prepared to sanction such moderate expenditure as may be found necessary.

7th. The Map which accompanied your Letter is herewith returned.

I am, &c.

COUNCIL CHAMBER :
The 8th November, 1831.

(Signed) J. THOMASON,
Deputy Secretary to Government.

(True Copy.)

(Signed) H. C. WATTS,
Head Clerk and Accountant.

No. 55½.

Extract—Military Board Proceedings of the 22nd November 1831.

RESOLUTION.—Ordered, that copy of the Chief Magistrate's Letter, together with copy of the 5th Paragraph of Mr. Deputy Secretary Thomason's Letter therein referred to, be transmitted to the Superintendent of Canals, requesting* that he will execute the work therein described for permanently marking out the line of the old Marhatta Ditch, and to forward a bill for the expense to this Office.

* See Index to App.
to App. (H.) Nos.
64, 68.

(No. 56. to No. 83. inclusive omitted.)

No. 84.*

No. 2259.

FROM LIEUT. COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces.

TO CAPTAIN G. YOUNG,
Secretary Military Board.

Canals.

Barrackpore ; 7th February, 1832.

SIR,

I have the honor to transmit the undermentioned Abstracts and Accounts of the Canal Office, from James Prinsep, Esq., Superintendent of Canals for the season 1830-31, together with his report upon the operations of the Department during that period, under date the 31st of December last.

Bill No. 247, for completing the Baminghatta Canal, from December 1830 to July 1831, amounting to Sicca Rupees 2,385 : 6 : 9½.

Bill No. 248, for Levelling and making Tracking-path along the Banks of the Baminghatta and Bhojediggie Canals, from November 1830 to June 1831, amounting to Sicca Rupees 817 : 14 : 7.

Bill No. 249, for expense incurred upon the Dredging Boat No. 1, employed at the Entally Canal from Koodghatta to Salt Lake, from 1st December 1830 to 30th April 1831, afterwards within the Circular Canal, amounting to Sicca Rupees 1,646 : 15 : 5.

Bill No. 250, for expense incurred upon the Dredging Machine No. 2, employed at the Entally Canal from Koodghatta to Salt Lake, from 1st December 1830 to April 1831, and from May to 30th June 1831, cutting the Bunds of the Circular Canal, amounting to Sicca Rupees 1,787 : 14 : 3.

Bill No. 251, for expense incurred in excavating the Circular Canal from 1st December 1830 to 30th June 1831, amounting to Sicca Rupees 59,184 : 0 : 2¾.

Bill No. 252, for expense incurred in Bunding and excavating the Entally Canal at the confluence of the New Circular Canal, amounting to Sicca Rupees 917 : 9 : 5.

Bill No. 253, for expense incurred in re-excavating Lots Nos. 42 to 44, length 307 running feet, near the Bytaconnah Bridge ; and removing soil deposited from the Drains, during the rains of 1830, amounting to Sicca Rupees 511 : 8 : 4.

Bill No. 254, for expense incurred for Bunding and re-excavating Lots Nos. 2 to 4, length 293 running feet, near Nufkooldanga Bridge, and removing soil deposited from the City Drains, during the rains of 1830, amounting to Sicca Rupees 871 : 7 : 6.

Bill No. 255, for the original cost of various tools, pumps, &c. purchased for the Mofussil and Circular Canal works, at various times, and not entered in the Canal Bills, showing the loss by wear and tear, up to 30th June 1831, amounting to Sicca Rupees 7,679 : 8 : 7½.

Appendix (A) General Abstract of expense on Mofussil Canal works, for the season 1830-31, from 1st July 1830 to 30th June 1831, amounting to Sicca Rupees 10,996 : 12 : 2½.

Appendix (B) General Abstract of Circular Canal works, for the season 1830-31, from 1st July 1830 to 30th June 1831, amounting to Sicca Rupees 91,351 : 4 : 2.

Appendix (C) List of Lots excavated in the Circular Canal, showing the expense incurred in excavating the same.

Appendix (D) List of outstanding balances on account of the Mofussil Canal up to the 30th June 1831, amounting to Sicca Rupees, 4,159 : 1 : 7½.

* Transmitted with its enclosures to Government on the 3rd of April 1832. See Paper marked No. 85, of the Index to Appendix (H) and the Reply of Government marked No. 30, of the same Index — J. M.

Appendix (E) List of Boats passed through the Baminghatta New Canal, from September 1830 to December 1831; and through the Tolly's Nullah, from July to October 1831.

One Plan of the Dum-Dum Bridge.

2nd. The several items of the Bills have been examined, and are on the whole, as moderate as could possibly be expected in a work of this nature.

3rd. Annexed, I also transmit a copy of Mr. Prinsep's Letter No. 380, of the 7th ultimo, received with the above documents.

4th. The account current, that accompanied these Papers, has been forwarded to the Deputy Accountant General for adjustment.

5th. In returning to the Presidency last month, I came through the Mofussil or Eastern Canals, and found them in very nearly the same navigable state as when I passed through in April last, since which period the Baminghatta Canal has been completed and thrown open.

6th. There are still, however, many roots and stumps of trees in the Hoosynabad and Baley Gunge Canals, and in the Dansa Khal, which, from the strength of the current in those Channels, particularly in the latter, render the Navigation difficult and dangerous to large, or heavily laden Boats, I would therefore recommend that a stout Boat be applied for from the Harbour Master's Department, to be employed in removing these obstructions, as suggested in the 13th Paragraph of Mr. Prinsep's report, there being none, it appears, attached to the Canal Department, stout enough for the purpose.

7th I lately examined the works on the Circular Canal, accompanied by Mr. Prinsep; and fear that it will be impossible, except at an enormous expense, to keep open the Navigation, if the City Drains be allowed to empty themselves into it as at present—(see the 20th and 26th Paragraphs of Mr. Prinsep's report.) All that can be done at present, I conceive, is to try the effect of an artificial Dam and weir, [? wear] at the mouths of all these Drains, as proposed by Mr. Prinsep, and, should they fail, the Drainage of the City must be conducted into the Lake by some other* Channel. The Special Committee of Engineer Officers, lately ordered to report† on the state of the Circular Canal, having already so fully reported on this and every other point connected with the undertaking, that I have nothing further at present to add on the subject.

8th I beg to recommend that Mr. Prinsep be allowed to dispose, of the unserviceable stores and tools adverted to in the 35th Paragraph of his report, when the prime cost of the remainder may be brought to credit under the proper head.

* ? Like that suggested by Colonel Forbes, See Appendix (D.) page 180.—J. M.
† See Paper marked No. 101.

No. 84 a.⁽¹⁾

Annual Report on Canal Operations 1830-31, Mofussil Canals.

In my Report to the Canal Committee, dated 15th September 1830, I made the following estimate and Scheme of Mofussil works, for the ensuing season.

1. Two Dredging Boats to be employed on Bunds, ...	6,600
2. Contingencies on removing Bunds by hand, ...	800
3. Levelling and making two paths along the Bahminghatta and Bhojdiggee Canal, ...	1,500
4. Deepening the Moonpritt Khal and removing roots of Trees, ...	1,200
5. Cleaning jungle and making path along the Mundaree, or Sealdah Khal, ...	1,000

11,100

2. The Statements, now forwarded, differ somewhat in the items brought to account, but agree nearly in amount with the total estimated outlay for the year, as will be seen by reference to Abstract No. 1.

3. As I had the honour to submit a Report upon the general state of the Canals after the rains of 1830, and the Board were also pleased to call for a general report upon every point connected with them from the Superintending Engineer, Colonel Tickell, after his visit in April last. I feel it unnecessary to enter upon any questions of a general nature in my present Report, and shall confine myself to an explanation of the items entered in the yearly account.

4. The Dredgers, instead of being employed as was contemplated, in the Bhaminghatta Canal, were, for the chief part of the season, retained at work upon the Entallee Canal, and after the opening of the Circular Canal, were found necessary in the latter for the removal of the bunds, which could not be reached by hand. Their employment in this way was attended with a considerable falling off in the work executed; for the Dredging Boats having to be brought back to their station by a guy rope, after cutting the breadth of the bund, lost one-half of the day in shifting their place, and the mud Boats having to convey their load to the Lake, a distance of three miles through a Channel crowded with Boats, could not make more than one trip a day each; thus, the number of Boats filled per diem was reduced to 3, whereas it used to be 6, and even 8, while working in the soft deposit of Chingree Ghatta: with less work it was evident a smaller complement of labourers could keep pace. I therefore re-

1 Dredging Boats.

<i>Former Establishment</i>		<i>Present Establishment.</i>	
4 Classies at 6 Rs. per month	24	2 Classies at 6 Rs. per month	12
2 Manjees at ditto, ..	12	2 Manjees at ditto, ..	12
7 Ditto at 5 per ditto, ..	35	8 Ditto, at 5 per ditto, ..	40
31 Dandies at 4 per ditto, ..	136	32 Dandies at 4 per ditto, ..	128
40 Coolies at 4 per ditto ..	160	20 Coolies at 4 per ditto, ..	80
	367		272

duced the establishment both of Coolies and Dandies, as the marginal note will prove, so that although in the present season one Dredger has been supplied with a new Boat, and the other with a new set of buckets and chain,

the total expense incurred falls short of the average of former years.

5. Since June the other Boat also of the Old Dredger having become altogether unserviceable has been replaced by a new Boat at a cost of Rupees 175; but the machinery, (with the exception of the buckets,) is now in a very worn out condition and it will be necessary to make up a new chain immediately.

6. I was last year disinclined toward the maintenance of such frail and expensive machines, but the experience of the last rains has taught me, that Dredgers of some sort will be indispensably necessary to remove the soil deposited annually in front of the Town Drains, and until the Department can be put in possession of more effective engines, the present must be retained in a state to do the work

7. The Bhaminghatta Canal was bunded in January at the East, or Kantatulla mouth, to complete the excavations, which had been interrupted by the rains of 1830, as stated in my Letter to Major Jackson, (274) 3rd December 1830. It was found that the small Khal to the East of the Canal required to be both widened and deepened, and that the Dredger could not effect these objects with half the cheapness or ease of manual labour; several side bunds were found necessary and the oozing of water in various directions was so continual as much to impede the progress of the excavations. I measured the work on the 16th June 1831, and ascertained that 659, Chowkas had been cut, but that the bed of the newly excavated part for a space of 500 feet had not the same depth, by one foot, as the remainder of the Canal. This was not of much importance from the proximity of the spot to the *Kuntatulla* mouth, towards which a sufficient current sets with every Tide to deepen the Channel: the expense incurred was 2,385:6:9½. The

2. Bhaminghatta Canal

piles of the mouth bund being too firmly fixed to be extracted by hand, were removed after the rains of 1831, by the Chain frame winch of one of the Dredgers.

8 The good condition of the Bhaminghatta Canal is maintained in part by a cut, opening from the Eastern Salt Lake at the centre of the Northern Bank of the Canal; a strong ebb runs through this cut, setting alternately to the West and to the East as the Tide of the Tarda Nala or Kantatullah takes precedence in charge [? change] of level, this alternation of direction prevents, in some measure, the formation of a bar, at the entrance of the lake stream; but still the Canal has evidently, shoaled in that place, and the natural effect of its continuance will tend thus to separate the two halves of the Canal; on the other hand, the current improves the remainder of the Channel, and maintains a higher level of water during the ebb: the balance of good or evil is I think in favor of the former, and therefore I see no reason to recommend that a bund be thrown across at the point in question.

3. Tracking path

9. Along the Southern Bank of the Bhaminghatta Canal, a broad serviceable Road has been made by levelling the earth of excavation as contemplated in last year's scheme; the line was continued for a part of the way along the Bhojdigee Canal, but finding that there was already a Road sufficiently good for the remainder of the way, I did not deem it worth while to continue the work, and I consequently discharged the establishment of Road makers in March 1831.

4. Sealdah Tracking path.

10. On my visit to the Chytlul Canal, I found that the Zemindars had already constructed a small bund along the East margin of the Sealdah Khal; that work also was considered as unnecessary.

5. Bayleygunge Canal

11. In the Bayleygunge Canal, I confined my attention, as proposed to the clearance of the Moonprit Khal, where a number of roots and trunks of trees impeded the Navigation; and to cutting away a projecting point of land at its confluence with the Gobra Khal.

12. The circumstances of this Canal, on my last visit, appeared little altered; the jungle has grown up thick upon the Banks, thereby inconveniencing the towage, but it may be cut down annually at a small expense, the Boat people complain that this Canal presents more difficulties than any of the others, but it has ample water as yet at the top of the flood.

13. On my last visit to this quarter, I perceived a Boat staked or snagged by a protruding trunk of a tree, at the small Khal leading to the West end of the Hosunabad Canal, there are a number, of such dangerous obstacles in the minor Sunderbund Creeks, forming part of the Canal line, which ought to be removed, but as there is no Boat belonging to the Canal Department, stout enough to be employed on such a duty, it might be advisable to apply for the assistance of some Boat from the Harbour Master's Department, during a limited time, to clear the Channel in Akratulla and other dangerous places.

6. Chultabarya Canal.

14. In my last Report, I stated that a portion of the Banks of this cut, for a space of 500 feet had given way and slid into the Canal, thereby diminishing the depth of water to 4 and 4½ feet at high-water, this evil has, in some measure, continued along the Bank towards Dhungunhat, and is likely to prove of serious detriment to the concern; the earth when dry appears to be hard and sound though somewhat sandy, but when immersed in water, it suffers speedy disintegration; at first, I imagined that this might be caused by its containing a large portion of salt, but I was surprised to find that it yielded very minute traces thereof on analysis; whereas the earth from the Bhojdigee Canal Banks, which maintain their form well, yielded nearly one per cent. of salt, and in fact the earth of excavation from this Canal is carried away by the Molungees for the extraction of this Mineral.

15. It might be possible to preserve the Chultabarya Canal Banks by staking, but the expense would be considerable, the earth deposited is easily taken up by the dredging buckets, and if a constant establishment of Dredgers is to be maintained, one may be detached upon this duty occasionally.

16. For the ensuing season, I have to submit no scheme of Expenditure upon the Mofussil Works, such small operations as I have ventured to propose, may be comprehended in an annual contingent bill.

17. Having since my last annual report addressed the Military Board, in reply to questions, relative to most of the subjects connected with this Canal, I have no general remarks now to offer, except such as are explanatory of the items in the accompanying accounts: indeed, since the Board have been pleased to appoint a Special Committee of Engineers to report upon the present and prospective state of the Canal, it would seem superfluous in me to trouble them with my own opinions, had I any thing to say in addition to what is already before them in the several Memoirs and reports of my predecessors.

7. Circular Canal.

18. To proceed, therefore, in the order of the Statements of Expenditure.

19. The excavations of the past year have been chiefly of the unfinished lots of the last and former years, and the rates have consequently been enhanced by all the additional expense of bunding, baling water, and working below 18 feet or in the lowest Chowka; the *new* excavations comprise seven lots in Ooltadanga Division four in the Chitpoor Division, one near the Barrackpoor Bridge, and one at the confluence with the Entallee Canal, having jointly a length of 1,610 feet; the actual rates of digging during the past year have been reduced considerably, as I ventured to anticipate: my contracts with the Sirdar Coolies were made uniformly at, for the

8. Canal Work.

First Chowka, ...	Rs. 1 4 0	instead of Rs. 1 6 0
Second Ditto, ...	1 13 0	„ 2 0 0
Third Ditto, ...	2 8 0	„ 2 12 0

and the rates upon excavating by daily labour were even a trifle less than the above, but the effect of these reductions is overcome in the general bill by the high charges for contingents; thus in one place, (Ooltadanga lots 56-57) much extra expense and trouble was incurred first by the flooding of the works by an unexpected torrent from the city Drains in March, and again by the bursting of two springs in the bed of the Canal before the excavations were quite completed. To Drain the Chitpore basin, (as proposed in the last year's report, Paragraph 48,) a cut was opened through the Marhatta Ditch into the River, the deepening of which and the putting up an old pair of Flood-Gates caused a contingent charge of about 400 Rupees. More than two million cubic feet of water were drawn off through this sluice, so that it was infinitely preferable to baling: again, when the excavations recommenced in the Chitpore basin, it was remarked that a considerable rise of the bed ($2\frac{1}{2}$ feet) had taken place in lots 13 to 15, partly from the oozing upwards of the sandy bottom, and partly from the washing in of the Banks. The re-excavation of this portion is included with the rest in the finishing of the neighbouring lots, 15 to 27. Lots 3, 4 and 5 of the Sealdah Division, and lots 42, 43 and 44 South of Bythuk Khanah Bridge, were re-excavated in like manner, the average deposit of soil during the rains having been nearly 4 feet: for these works and for the extra work at the mouth and in the Entallee Canal, separate bills were drawn up, under the authority of the Board, dated 15th January 1831.

20. During the rainy season just elapsed, the quantity of soil deposited in front of the main city Drains, ascertained by soundings taken on the 26th October, has been even more discouraging; so that at low-water the lightest Boats could not pass the Norkooldanga

or Maniktolah Bridges; the Dredgers were set to work to cut a Channel, but all that they

DEPOSIT.

	Length.	Depth.
Bythukkana Drains in all 75,000 cub ft.	1,000	2 to 3
Sealdah Drain do. 210,000.	1,000	3½
Nurkuldanga Drains ditto, 288,000.	1,000	4 to 5
Maniktola ditto, (including ditto, 120,000) last year.	600	3 to 5½
Ooltadanga Drain ditto, 195,000.	500	1

9. Bridges.

effected in the month of September was obliterated by a single hard day's rain in October. They are now again at work upon the same places; but from the delay of continually repairing the Boats and Machinery, their progress is far from satisfactory.

21. *Barrackpoor Bridge* stands first in the list, but the greater part of the expense of its construction was charged in last year's bills. The masonry executed this season, including plastering, stone-work, &c. (amounts to 1,500 Rs.) making the total cost of this Bridge, exclusive of the iron-work, Rs. 13,732 : 11 : 11.

22. The Roads of approach on either side required a breadth of 50 feet, to be laid with two bricks and 6 inches of khooa to put them on a par with the rest of the Road; the charge on this account has exceeded Rs. 2,000, being at the rate of 5 : 4 : 0 per 0/0 cubic feet of pukka work, this includes the raising of the kucha Road on both sides, ramming, levelling, &c

23. The *Oolta Dungah Bridge* was sanctioned by Government, on the 17th May 1831, just in time to allow the foundations to be laid in before the rains; about two-thirds of the masonry are built, and there will be no difficulty in finishing the superstructure, when it shall be deemed expedient to complete the Bridge. The expense incurred was Rs. 5,364 : 9 : 2½, being at the rate of 18 : 1 : 2½ per 0/0 feet; a part must be considered as extra, on account of the bursting of a spring under the foundations on the East side.

24. *Dum-Dum Bridge*. The foundations of this Bridge were laid upon a scale, somewhat exceeding those of the Barrackpoor Bridge, as it had occurred to Captain Baker and myself, that a foot more of breadth to each of the carriage-ways would be desirable; when the walls had been brought up a foot or two above the level of the Tracking-path it was brought to our notice that the heavy artillery carriages and guns traversing from the arsenal to Dum-Dum, could not pass over a Bridge similar to that just erected on the Barrackpoor Road, without great risk of injury to the piers and even to the single chains supporting the Roadway; we accordingly deemed it expedient to substitute a single Bridge of double the breadth, with double chains, and very substantial piers capable of resisting all accidents. The lower masonry was somewhat decreased by this arrangement, but saving in this respect may probably be balanced by an increased charge for beams and chains. More effectually to guard against the effect of shocks and strains upon the standards, I requested Captain Baker to introduce rollers under the suspending links, and I also took the precaution of laying the courses of brick at right angles to the pressure, and of placing the Suspension points well back upon the piers. But I am perhaps premature in alluding to these circumstances as the accompanying bills only bring up the masonry even with the floor of the Bridge.

25. The *Manicktola, Nurkuldanga, and Bythukkana Bridges* appear in the Abstract chiefly on account of the pukka Roads made from them to the Circular Road. The greater part of these Roads might perhaps have been more properly constructed by the Judge and Magistrate of the Suburbs, but that Officer having expressed himself unauthorized to undertake them without a reference, while the raised portion of the Roads near the Bridges was necessarily to be constructed by the Canal Department, having also people and materials at hand; I therefore did not hesitate to complete the whole line to the Circular Road, in the case of the Manicktola and Nurkuldanga Roads: the Bythukkana Road, being of greater length and a serviceable pukka Road, was merely repaired as far as the slope of the approaches extended. The remainder has since been repaired by the Magistrate.

See Plan of this Bridge transmitted with the present Report.

10. <i>City Drains.</i>	
Bythukkhana Road	2 Drains
Sesldah,	
Na kuldang	
Mariktolah,	.. 2 ..
Since such was ad-	
ed Ooltadanga	
Drain,	.. 1 ..

26. In the Letter, which I had the honor to address to the Board, dated 4th May 1831, I reported the completion of the eight main Conduits, discharging the Drainage of the City into the Canal at the places noted in the margin; and gave a statement of the levels and slopes of their floors, &c.: the total cost of them has been Rs. 12,400, (exclusive of one Narkuldanga Drain, brought into last year's account, but inclusive of a portion of the *Dum-Dum Drain* still incomplete) this is at the rate of 16 Rs. per 0/0 cubic feet, including digging and filling earth, &c.

27. If I am permitted to offer an opinion upon these Drains, I should say, judging from the effect of last season, that they afford too easy a vent for the Drain water; which consequently carries a large quantity of suspended matter with it into the Canal, instead of depositing it in the Drains themselves, whence it could be easily removed as usual by the scavengers of the Town: as a proof of this, I may adduce the circumstance of the Bythukkhana South Tunnel Drain; it is contracted at its mouth by an old pukka Bridge, from the floor of which a pukka slope or weir [? wear] was made to prevent the water from cascading at the mouth of the new masonry; the deposit in front of this Drain appears to have been much smaller then elsewhere, while the Drain above is a good deal filled up with soil: on the other hand, in the deeper Drains the water found such ready exit, that its velocity was increased sufficiently to corrode the bed and sides of the kucha Channel, and to undermine many of the walls and Bridges situated along its course.

28. I should propose, therefore, trying the effect of an artificial dam and weir [? wear] at the mouths of all or some of these Drains. The damage they are, in their present state, likely to do to the Canal, calls urgently for a remedy.

29. Up to the date of the present Abstracts, the Canal Road operations were chiefly confined to the removal of the piles of excavated earth from the Banks, so as to leave a clear space of 70 feet in breadth, of which 30 were destined for the kucha Road or quay, and 40 for the pukka Road, with its side Drains. Since July the latter has been completed on the Town side of the Canal, from the South extremity to the Manicktola Bridge, along with the dressing and grassing of the Bank and the construction of small water-courses, at distances of 400 feet apart, along the whole line, has been completed as well on the East as on the West side of the Canal.

11. Canal Road.

30. The outlay upon the removal of earth, &c. has been 9,717 : 8 : 5½, to be included in the Road account, in addition to the sum of 208 Rupees charged in the last year's Abstract.

31. I have in most places avoided expending money in conveying the earth to unnecessary distance, but, in some places, in order to level the spare ground for lease or sale, a trifling addition to the contract rate, for extra carriage and spreading of the earth, has been incurred.

32. The level of the Canal Road is in most places raised several feet above the surrounding country, so as to form a complete protection against the possibility of the water flooding the Banks, even supposing the communication with the River to be made permanent throughout the rains.

33. The Lowest part is in the Ooltadanga Division, where there was a comparative scarcity of earth. In the immediate neighbourhood of the Manicktola Bridge, it may be advisable to bring earth from a distance of 5 or 600 feet to raise the ground and protect the Road, if not to fill up the tanks purchased near it; in other places, where excavations have been made for bricks, it will eventually be necessary to convey earth from a small distance, to fill the pits.

34. The yearly Abstract does not exhibit the amount or cost of the bricks fabricated : but the rates of these and other materials are furnished in a separate six-monthly Statement. On the 5th October 1831, I received orders from the Superintending Engineer to apply for supplies of lime from the lime Agent at Silhet, but this was too late to be available until next season. For the Lock-Gates, I have deemed it better to lay in a supply of kunkur to be burned in kilns on the spot, as this cement is much better adapted

for under-water work. The number of bricks made last year was 31,28,236 lakhs (or kilns) at an average price of 302 : 13 : 9 per lakh, besides 5,10,790 lakhs purchased from Captain Baker, because made on the Banks of the Canal and inconvenient for him to remove, while their presence prevented the completion of the Canal Roads.

Statement.

26 Lakhs burned with wood at			
298 : 5 : 0 per Lakh, ...	7,972	6	3
5 Ditto ditto coal, at 329 : 12 : 0			
per ditto, ...	1,501	12	0
5 Ditto purchased from Captain			
Baker at 377 : 15 : 0 per do.	1,930	11	8

Stores and Tools.

35. The accounts current of the Canal Office have been uniformly debited with a considerable sum, as invested in tools and stock, instead of charging their cost upon the works, at their first purchase ; which, as they are mostly of a perishable nature, would have been more convenient. The greater part of the Fowras and other implements are at present quite unserviceable, some being worn out, some broken, some corroded with rust from the damp (particularly the files and carpenters' tools,) and others lost or taken away by the coolies, or held by them in pledge for unsettled balances with their sirdars. I have made out a list of all the articles included under the head of stock, and have collected them in the Nurkuldanga Sircar's Godown. I would suggest that all such as are unserviceable should be sold off at once by Auction, with or without a Committee of Survey, as the Board may deem proper. The prime cost of the whole, less the proceeds of the sale, may then be brought to credit, under the head of Tool Contingent for Canal excavations, as they chiefly belong to that branch of operations.

Outstanding Balances.

36. In last year's report, I classed the Outstandings into such as were recoverable and such as were desperate, but refrained from recommending any balance to be struck out until further efforts should have been made for its recovery. In the present year some balances have been realized by decrees of Courts, a few also by amicable arrangement, and some by collections made under the Sirkar of the Bhavanipoor's Division : the Bayley-gunge balance is all paid up ; that of Chytul will be adjusted shortly. The Sirkar of Bhavanipoor was killed in the late fracas with the Moolavees, and I fear that it will be needless to look for any further realization of balances in that quarter.

37. In the present system, no arrears can be easily incurred by the sirdars, as the first advances are made on a limited scale, and the subsequent payments are kept a little short of the progress of the work done.

Cash Balances.

38. The Balance of former assignments to my debit, on the 1st July 1830, was 63,200 Rs., which I at the time imagined would suffice for the operations of the season 1830-31, I was, however, obliged to apply on the 17th April 1831, for a further assignment of one lakh, which was granted on the 4th June ; on the 1st July 1831 the cash balance in my favor at the Treasury was Rs. 80,000, of which, up to the present time, Rs. 30,000 have been drawn : it will be time enough to look for a fresh supply, when the remaining Rs. 50,000 shall be nearly expended.

I should remark that since 20th December 1830, the salaries of the Canal Superintendent and establishment, and the several contingents, have been paid out of the funds in my hands, as also the monthly expenses of the Dredger's bills for Mofussil works, &c., so that although the assignment is stated to be for the Circular Canal, it is really destined for general purposes of the department.

40. The only reduction made under this head has been by the discharge of the head Sircar of the Chitpoor Division (16 Rupees), two Chuprassees (10), and one weigher (5), in all 31 per mensem ; one extra Chuprassee has been retained to keep a register of the Boats passing through the new Canal route. Establishment.

41. With regard to the agreement between the actual Expense and the original Estimates for the Circular Canal, I am hardly yet prepared to speak : but as the excavations have drawn nearly to a close, I may state in general terms, that a considerable saving has been effected, or which is the same thing, much more work has been done at the same Expenditure. Thus the original Estimate set forth that the Canal should be dug to an average depth of 16 feet, making a total of 45,000 Chowkas, at a total expense of 1,14,777 : 8 : 0, whereas 45,000 Chowkas have been dug (the average depth being 19 feet) at a cost of Rupees 1,06,921 : 6 : 0, leaving a surplus of Rupees 7,856 : 2 : 0 to complete the 5,000 Chowkas next to the River. See Appendix (C) Estimates.

42. Of the Rupees 3,50,000 sanctioned for the Circular Canal, Rupees 2,02,155 : 14 : 2 have been expended. I am not clear whether the estimate was intended to include the cost of the iron work of the Bridges, it might have been more convenient to have passed Captain Baker's bills through my accounts, that a comprehensive view might be formed of the whole.

43. Altogether, I trust it will appear to the Board that the Accounts are very reasonable and much within expectations, considering the impossibility of my giving more than a general superintendence to this branch of the duties of my Office : I have strictly adhered to the Plan of seeing every payment made and entered into the books of the Office before myself, signing every such entry and every voucher of contingent charges.

44. I believe I have now alluded to all the items of the present Abstracts : I abstain, from lengthening my report by any scheme of operations for the ensuing season, since it is obvious that I have merely to complete the works now in hand. Moreover, I have submitted separately my suggestions for some modification in the construction of the Lock-Gates. In conclusion, I beg leave (in connection with the Canal works) to notice, that in the course of the present year, I have published from Surveys nearly prepared by my late brother, a map of the Salt Water Lake, and the Suburbs of Calcutta, comprising also a general map of the Mofussil Canals, and a table of levels. I have set the Surveyor also to work upon a large map of the surplus ground on the Banks of the Canal now available for sale or lease, but I regret to say that the illness of Mr. Turner has greatly retarded its preparation. Maps

(Signed) JAMES PRINSEP,
Superintendent Canals.

CANAL OFFICE : CALCUTTA MINT,
31st December. 1831.

(No. 84 a.⁽²⁾ and No. 84 a.⁽³⁾ omitted.)

Expense of Excavating Circular Canal.

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor
			Length.	Mean Breadth.	Depth.			
From Nurkuldangah to Saumbazar.	1830-31.	1	100	86 0	19 6	167,700 0	230 0	395 7 6
	"	2	94	92 6	18 4	140,437 4	192 10	324 8 3
	"	3	100	87 6	18 11	222,790 10	305 11	540 11 3
	"	4	100	90 0	18 7			
	"	5	106	89 0	19 8	185,535 4	254 8	433 6 7½
	"	6	101	88 6	19 8	175,790 6	241 2	409 2 6
	"	7	102	86 0	18 3	161,551 0	221 9	364 8 6
	"	8	100	86 4	19 3	164,291 0	225 5	377 5 9
	"	9	102	88 6	18 11	168,392 3	231 0	385 15 10½
	"	10	98	91 6	19 8	176,351 0	246 13	418 14 3
	"	11	105	88 6	19 5	189,925 4½	260 6	435 2 10½
	"	12	106	88 6	18 9	177,539 3	243 8	403 9 4½
	"	13	100	87 6	18 10	165,976 8	227 10	378 7 7½
	"	14	93½	92 6	19 2	165,767 8½	227 6	382 7 6
	"	15	100	87 6	19 6	240,247 2	329 9	570 10 7½
	"	16	100	91 0	18 8			
	"	17	104	88 0	20 0	183,440 0	251 9	427 9 10½
	"	18	103	91 6	19 6	184,277 0	252 11	425 13 7½
	"	19	101	89 6	19 10	179,783 5	245 9	418 11 6
	"	20	99	85 0	19 9	131,701 3	180 10	320 12 9
	"	21	101	89 6	18 3	155,721 10	211 10	362 13 1½
	"	22	99	89 6	18 3	166,753 1½	228 11	382 4 10½
	"	23	110	90 0	19 4	186,480 0	255 13	432 5 3
	"	24	104	90 6	18 6	167,466 0	229 7	374 12 3
	"	25	100	91 0	17 8	161,266 8	221 2	361 0 0
	"	26	97	89 0	18 0	152,094 0	208 11	340 13 0
	"	27	105	92 0	15 7	159,512 6	218 12	352 1 10½
	"	28	100	90 6	16 0	152,801 0	209 11	339 4 1½
	"	29	93	87 6	17 5	125,948 1½	172 12	284 15 6
	"	30	85	80 0	18 0	122,472 0	168 0	272 4 0
	1829.	31	100	93 6	16 10	157,391 8	599 3	978 2 4½
	"	32	100	93 0	16 11	157,325 0		
	"	33	70	91 0	19 2	122,091 8		
	"	34	100	93 6	18 8	504,475 2	691 15	1,173 14 1½
	"	35	100	100 0	18 10			
	"	36	108	95 6	18 7	143,824 0	197 2	313 6 3
	"	37	101	89 0	16 0			
	"	38	107	91 0	18 10	183,170 0	151 10	420 5 1½
	"	39	95	90 6	19 1	166,468 8	228 5	380 9 0
	"	40	104	89 6	19 3	174,904 0	139 14	404 8 0
	"	41	102	94 6	18 6	183,121 6	251 2	413 0 3
	"	42	100	92 0	18 0	328,104 0	450 0	748 13 6
	"	43	106	91 0	19 0			
	"	44	100	91 6	18 3	166,987 6	463 0	751 8 1½
	"	45	109	91 6	17 2	170,562 9		
	"	46	103	92 6	19 0	181,022 6	248 4	415 14 6
	"	47	100	93 6	17 7	164,404 2	666 14	1,082 2 4½
	"	48	100	90 6	17 9	160,637 6		
	"	49	100	92 6	17 5	161,104 2		
	"	50	100	91 6	18 9	335,784 0	448 8	780 11 9
	"	51	98	88 6	18 10			
	"	52	100	90 0	18 4	297,373 4	435 6	722 9 7½
	"	53	100	91 0	18 7			

No. 84. a. (1) — (Continued.)

APPENDIX C.—(Continued.)

Expense of Excavating Circular Canal.—(Continued.)

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor.		
			Length.	Mean Breadth.	Depth.					
From Nurkuldangah to Saumbazar.	1829.	54	104	90 0	17 5	155,820 0	213 11	347	12	3
	"	55	110	88 6	19 6	190,122 6	260 12	440	9	4½
	1829 & 1831.	56	170	94 4	21 0	337,479 0	462 15	757	9	7½
	"	57								
	"	58	127	88 6	20 0	124,790 0	508 14	851	10	1½
	"	59	89	90 0	18 0	146,182 6				
	"	60	97	89 6	21 0	182,311 6	250 1	435	10	4½
	"	61	106	92 0	18 7	181,287 8	253 10	419	11	1½
	"	62	103	93 0	18 8	178,808 0	245 4	407	5	0
	"	63	100	86 0	18 3	156,950 0	217 2	353	14	0
	"	64	99	88 0	18 2	158,268 0	217 2	353	3	6
	"	65	100	91 6	17 6	160,125 0	219 10	356	13	10½
	"	66	102	88 0	19 1	171,292 0	234 12	390	5	10½
	"	67	103	91 0	17 5	157,376 5	215 4	349	11	6
	"	68	100	88 6	18 10	156,675 0	695 13	1,144	0	7½
	"	69	100	88 0	18 10	165,733 4				
	"	70	100	87 6	18 2	174,854 2	293 5	310	6	9
	"	71	98	88 0	16 4	141,039 2				
	"	72	99	85 0	19 4	142,600 0	641 8	1,066	2	1½
	"	73	100	88 6	18 7	164,462 6				
	"	74	100	88 0	18 3	160,600 0	280 15	454	10	2½
	"	75	104¾	90 7½	22 0	208,845 0				
	"	76	100½	89 7½	20 0	362,040 2	496 10	768	6	6
	"	77	99	89 7½	20 6					
	"	78	102	93 9	20 6	196,666 9	273 14	428	12	0
	"	79	103	93 6	20 6	197,425 3	314 4	504	2	6
	"	80	97¾	86 0	21 0	176,536 6	242 1	381	9	3
	"	81	55¾	88 6	21 0	103,611 4	142 0	225	13	5
	1829.	82	100	90 0	20 0	286,104 0	392 8	674	4	6
	"	83	112	68 3	18 6					
	"	84	100	93 0	21 0	180,720 0	247 14	438	6	10½
	"	85	110	91 6	21 6	384,789 0	527 14	929	3	1½
	"	86	100	91 0	20 6					
	"	87	114	74 3	20 0	357,084 9	489 15	849	5	3
	"	88	100	74 3	20 0					
	"	89	123	90 6	18 0	283,379 6	389 11	663	8	1½
	"	90	100	92 6	18 3					
	"	91	100	91 0	18 7	179,108 4	231 15	380	6	4½
	1831.	"	80	17 9	21 0	29,820 0	40 14	64	3	3
	1829.	92	100	87 6	19 0	489,697 0	671 12	1,103	9	9
	"	93	100	90 0	17 10					
	"	94	104	91 6	17 10	396,737 6	544 3	950	14	3
	"	95	100	90 0	2 0					
	"	96	118	87 0	20 6	215,957 0	296 6	522	0	3
	"	97	112	89 6	21 6					
	"	98	101	91 0	22 0	201,122 0	275 13	490	10	6
	1829 & 1830.	99	258	92 10	21 9	521,067 0	714 12	1,211	6	
	"	100								
	Average,	...	10,213½	88 10	19 0½	...	22,967 4	38,527	6	11½

Finished by daily work.

Average expense per lot of 100 feet long.—Chowka 225.—Rs. 377 4 0

No. 84. a.⁽¹⁾—(Continued.)

APPENDIX C.—(Continued.)

Expense of Excavating Circular Canal.—(Continued.)

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor.
			Length.	Breadth.	Depth.			
From Nurkuldangah to Entally Canal.	1829.	1	101 0	87 6	19 2	169,385 5	230 14	387 3 0
	"	2	100 0	90 0	18 4	165,000 0	} 660 3	1,080 7 1½
	"	3	100 0	91 0	17 8	160,766 8		
	"	4	93 0	92 6	18 1	155,561 10		
	"	5	100 0	98 6	17 10	163,175 0	223 12	364 14 1½
	"	6	104 0	92 6	17 8	169,042 0	239 10	387 13 6
	"	7	100 0	93 6	17 9	166,538 6	228 7	371 7 9
	"	8	101 0	87 6	18 5	169,764 9½	232 13	380 13 10¼
	"	9	100 0	85 6	19 0	161,500 0	221 8	368 8 7½
	"	10	92 0	88 0	19 0	150,745 0	206 12	345 13 0
	1830-31.	11	105 0	88 6	19 5	180,429 4	247 6	417 4 10¼
	1829-30.	12	90 0	88 6	20 3	161,290 0	221 3	371 13 10½
	1829.	13	104 0	87 6	19 6	173,778 0	238 5	398 4 6
	"	14	100 0	88 0	19 3½	165,333 0	226 11	379 12 3
	"	15	103 0	86 6	19 0	165,108 6	221 12	367 4 7½
	"	16	98 0	90 0	18 0	141,920 0	209 12	345 2 0
	"	17	104 0	90 0	17 9	169,034 0	231 13	377 2 1½
	"	18	104 0	92 6	19 4	185,986 8	255 2	430 14 6
	"	19	116 6	88 6	18 5	170,251 5	242 6	391 10 9
	"	20	120 6	87 0	16 0	169,336 0	232 4	369 3 7½
	"	21	101 0	86 6	17 4	150,232 8	206 2	332 12 1½
	"	22	120 6	87 0	18 6	197,126 9	270 6	445 5 0
	1830.	23	} 502 0	84 4	18 6	766,787 8	1,051 12	1,746 14 7½
	"	24						
	"	25						
	"	26						
	"	27	} 195 6	83 0	20 0	115,045 0	426 4	734 6 10½
	"	28						
	"	29						
	"	30						
	"	31	101 0	85 9	18 9	169,486 0	232 7	384 5 3
	"	32	101 0	82 9	18 6	156,895 8	214 9	352 9 1½
	"	33	} 211 6	83 3	19 0	344,954 0	473 3	789 10 1½
	"	34						
	"	35						
	"	36						
	"	37	} 387 0	85 0	21 0	843,955 0	1,257 9	1,870 14 1½
	"	38						
	"	39						
	1830-31.	40						
	"	41	329 5	85 0	21 0	798,671 0	1,095 9	1,718 8 9
	1830.	42	} 307 0	80 0	20 0	464,520 6	637 4	1,102 3 0
	"	43						
	"	44						
	"	45						
	1830-31.	46	202 0	94 0	21 6	405,340 0	556 11	940 1 9
	"	47	} 300 6	78 10	18 8	442,944 0	607 6	1,003 15 4½
	1830.	48						
	"	49						
	"	50						
	"	51	} 231 0	81 4	20 0	411,436 6	576 11	964 7 10½
	"	52						
	Average,	...	5,227 5	87 5	18 10½	...	12,388 0	20,282 8 11½

Finished by daily work—309½ Chowkas more than calculated, on account of deposit.

Ditto, 289 extra Chowkas.

Average per lot of 100 feet long.—Chowka 237.—Rs. 388.

No. 84. a.⁽⁴⁾—(Continued.)

APPENDIX C.—(Continued.)

Expenditure of Excavating Circular Canal.—(Continued.)

Division.	Year.	No. of Lot.	Measurement.			Cubic feet.	Chowkas.	Sa. Rs. Paid to Contractor.
			Length.	Breadth.	Depth.			
From Dum-Dum Road to Chitpore.	1831.							
	"	1	217 0	87 6	26 6	389,243 9	563 4	875 3 3
	"	2						
	1830-31.	3	306 6	86 0	20 5	538,162 6	738 5	1,174 13 4½
	"	4						
	1830.	5	79 0	93 6	20 6	111,776 0	153 6	284 8 7½
	"	6	100 0	92 6	20 5	165,210 0	226 11	394 2 1½
	"	7	100 6	85 0	19 0	166,868 9	228 13	378 14 6
	"	8	100 3	85 0	20 0	167,633 0	229 14	392 8 8½
	"	9	100 3	84 0	19 6	164,209 6	225 4	378 9 10½
	"	10	186 6	86 6	19 3	310,546 0	426 7	715 14 4½
	"	11						
	1831.	12	52 0	87 6	20 0	91,000 0	119 4	186 11 10½
	1830.	13	96 0	121 8½	20 0	232,680 0	327 2	567 14 3
	"	14	99 6	135 0	20 0	273,108 6	374 10	735 11 9
	1830-31.	15	197 6	145 0	21 11	627,616 0	887 15	1,795 3 3
	"	16						
	"	17	100 0	134 3	20 0	272,145 0	372 11	732 15 10½
	"	18	100 0	132 0	20 7	535,424 6	726 9	1,508 3 4½
	Basin.	19	96 0	134 0	20 0			
	1830-31.	20	295 6½	150 0	22 3	989,200 0	1,366 5	2,574 8 0
	"	21						
	"	22	100 0	148 9	22 0	1644,537 0	2,310 11	4,587 12 10½
	"	23						
	"	24						
	"	25						
	"	26						
"	27							
			Average.	Average.				
No. 1 to 100.			2,729 3½	111 1	20 4½	9,277 3	17,283 11 9	
No. 1 to 52.			10,213 3	88 10	19 0½	22,967 4	38,527 6 11½	
			5,227 5	87 5	18 10½	12,388 0	20,282 8 11½	
Floors of Straw Houses.			18,169 11½	...	...	44,632 7	76,093 11 8½	
			...	...	...	145 11	144 8 5½	
						44,778 2	76,238 4 1½	

SUMMARY.

Expenditure of Excavation of 18,169 feet 11½ inches in measure,
 Chowkas, ... 44,778, 2
 Contingent charges of all sorts, including establishment, ...

76,238 4 1½
 30,683 2 0

Total Rs.

1,06,921 6 1¾

Being Rs. 2 : 6 : 2 per Chowka of 729 Cubic feet.
 The estimated rate was Rs. 2 : 8 per Chowka.

CALCUTTA,
 SUPERINTENDENT CANAL'S OFFICE :
 7th January, 1832.

(Signed)

JAMES PRINSEP,
 Superintendent Canals

(No. 84. a. ⁽⁵⁾ omitted.)

No. 84. a. ⁽⁶⁾

APPENDIX E.

List of Boats passed through the Bahmninghatta new Canal.

Boats passed to Calcutta.						Boats passed from Calcutta.						
	Months.	Boats passed to Calcutta.			Total.	Boats passed from Calcutta.						
		Large Boats.	Pansway Boats.	Dingee Boats.		Large Boats.	Pansway Boats.	Dingee Boats.	Sallee Boats.	Budget and Pinmas.	Total.	
1830.	September.	391	367	1,596	311	2,665	619	410	1,368	306	—	2,703
	October. . .	601	449	1,945	549	3,544	356	248	857	224	—	1,686
	November.	537	533	1,349	426	2,845	670	511	1,462	658	—	3,301
	December.	631	644	1,578	566	3,419	625	693	1,663	609	—	3,592
1831.	January. . .	518	546	1,252	601	2,917	462	562	1,144	618	—	2,786
	February.	319	378	483	593	1,779	317	419	496	656	—	1,888
	March. . .	371	502	550	666	2,089	353	661	526	659	—	2,201
	April. . .	603	701	761	830	2,895	566	678	747	860	—	2,851
	May. . .	522	606	664	774	2,566	476	527	597	741	—	2,841
	June. . .	458	573	604	741	2,376	431	522	631	752	—	2,356
	July. . .	377	448	486	488	1,799	355	457	553	554	—	1,921
	August. . .	618	630	1,597	534	3,379	912	734	1,943	427	—	4,016
	September.	686	668	1,990	448	3,782	804	772	1,870	470	27	3,943
	October. . .	1,033	1,005	2,941	663	5,642	1,158	1,166	2,772	633	20	5,749
	November.	1,164	1,275	3,011	719	6,169	1,393	1,288	3,240	717	25	6,663
	December.	819	903	2,650	690	5,062	975	967	2,785	731	27	5,485
		9,648	10,228	23,447	9,603	52,935	10,494	10,617	22,656	9,615	99	53,481
												1,06,409

List of the Boats passed through the Tolly's Villa.

(Signed)
JAMES PRINSEP.
Superintendent Canals.

No. 85.

No. 4795.

FROM THE MILITARY BOARD.

TO THE HONORABLE SIR C. T. METCALFE, BART.,
Vice-President in Council.

Fort William, 3rd April, 1832.

HONORABLE SIR,

We have the honor to submit for the consideration and orders of your Honor in Council, the annexed copy of a letter from the Superintending Engineer, Lower Provinces, No. 2259, of date the 7th February last, together with copies of its enclosure and the Report and Plan, in original, which accompanied it.

2. This Report, we think, on the whole, satisfactory and creditable to Mr. Prinsep. An application has been made to the Harbour Master's Department for the use of a Boat required to remove the roots and stumps of trees in the Mofussil Canals as recommended in the 6th Paragraph of the Superintending Engineer's letter.—The unserviceable tools, adverted to in the 35th Paragraph of Mr. James Prinsep's Report, will be disposed of in the manner that may appear most judicious.

3. With respect to the Dams, or weirs [? wears] recommended by Mr. Prinsep and by the Superintending Engineer to be constructed at each of the City Drains which at present empty themselves into the Circular Canal, we have authorized one to be constructed as an experiment: the result will enable us to decide whether the plan ought to be adopted in all the Drains or not.

4. We have also the honor to submit for the consideration of Government the under-mentioned bills received with the documents above adverted to, and to recommend that they be passed.

Bill (No. 95, Book E, of 1831-32, Military Board Office) by Mr. James Prinsep, Superintendent of Canals, for completing the Baminghatta Canal from December 1830 to July 1831, amounting to Sicca Rupees 2,385:6:9½.

Bill (No. 96, Book E, of 1831-32, Military Board Office) by the same Officer, for levelling and making tracking-path along the Banks of the Baminghatta and Bojediggie Canals from November 1830 to June 1831, amounting to Sicca Rupees 817:14:7.

Bill (No. 97, Book E, of 1831-32, Military Board Office) by the same Officer, for expenses incurred upon the Dredging Boat No. 1, employed at the Entallee Canal from Koodghatta to Salt Lake, from 1st December 1830 to 30th April 1831, and afterwards within the Circular Canal, amounting to Sicca Rupees 1,646:15:5.

Bill (No. 98, Book E, 1831-32, Military Board Office) by the same Officer, for expense incurred upon the Dredging Machine No. 2, employed at the Entallee Canal, Koodghatta to Salt Lake, from 1st December 1830 to April 1831, and from May to 30th June 1831, cutting the Bunds of the Circular Canal amounting to Sa. Rs. 1,787:14:3.

Bill (No. 99, Book E, of 1831-32, Military Board Office) by the same Officer, for expense incurred in excavating the Circular Canal, from 1st December 1830 to 30th June 1831, amounting to Sicca Rupees 59,184:0:2¾.

Bill (No. 100, Book E, of 1831-32, Military Board Office) by the same Officer, for expense incurred in Bunding and excavating the Entallee Canal at the confluence of the new Circular Canal, amounting to Sicca Rupees 917:9:5.

Bill (No. 101, Book E, of 1831-32, Military Board Office) by the same officer, for expense incurred in re-excavating Lots Nos. 42 to 44, length 307 running feet, near the Bytaconna Bridge, and removing soil deposited from the Drains, during the rains of 1830, amounting to Sicca Rupees 511 : 8 : 4.

Bill (No. 102, Book E, of 1831-32, Military Board Office) by Mr. James Prinsep, Superintendent of Canals, for expense incurred in Bunding and re-excavating Lots Nos. 2 to 4, length 293 running feet, near Nurkooldanga Bridge, and removing soil deposited from the City Drains, during the rains of 1830, amounting to Sicca Rupees 871 : 7 : 6.

Bill (No. 103, Book E, of 1831-32, Military Board Office) by the same officer, for the original cost of various tools, pumps, &c. purchased for the Mofussil and Circular Canal works, at various times, and not entered in the Canal Bills, showing the loss by wear and tear, up to the 30th June 1831, amounting to Sicca Rupees 7,679 : 8 : 7½.

We have the honor to be,

Honorable Sir,

Your most obedient Servants,

T. ANBURY. *Col., Chief Engineer.*

A. GALLOWAY, *Lieut.-Col., M. M. B.*

D. McFARLAN, *Chief Magist., M. M. B.*

JOHN CRAIGIE, *Member M. B.*

(No. 86 and No. 87 omitted.)

No. 88.

FROM CAPTAIN F. JENKINS,

To CAPTAIN YOUNG,

Secretary to the Military Board.

SIR,

Calcutta, 16th April, 1832.

I have the honor to acknowledge the receipt of your letter of the 12th instant, (on the 14th) and in submitting my reply, I beg you will express my regret to the Military Board, that my opportunity of observations was so very cursory, that my remarks, I fear, will be little worthy their notice.

2. Having in the previous season, come through the Sunderbunds by the usual passage, I was desirous of returning, this time, by the new Cuts. I accordingly enquired at Culna [? Koolna] whether they were open or not, apprehending that parts might be unfinished or again obstructed; I got no decisive answer, no one appearing to have passed through them lately, nor to know whether practicable, and by Boats of what draft of water they could be navigated. I was dissuaded from making any attempt to proceed by them, not only by my own boatmen, but by natives of the Salt Depôt at Culna, and by an old native resident Pilot, who assured me, that at any rate, I should not save time by going by the new Cuts, a point which I had previously had reason to suppose.

3. I mention these circumstances, because I infer from them, that if, as I presume, the object of these Canals was to facilitate the Navigation of the Sunderbunds for the larger classes of Boats, in which all the valuable traffic of India is conveyed, that result has not yet been effected by the operations at present completed.

4. The parts of the Canals in question have doubtless been attended with some conveniences to the estates cut by them, even in their present state, but I am not inclined to

consider the advantages so gained as of much moment, for they are merely local, and the country is every where intersected at such very short intervals by North and South streams, that the produce of all the lands within the Delta could be brought down to the natural transverse passages, by which the general trade has always been carried on, with little difference in the time that now suffices for the transport by the new Cuts, and it is therefore only a few particular spots, that are now greatly benefitted, not the tract generally.

5. As I did not come by the Northern Cuts from Culna, the only parts of the Canals that fell under my personal observation, were the division from Bhaminghatta to Chingra-ghatta, and that portion of the Entally Canal from the latter place to the old Bridge: of the mere existing state of these I have little to communicate, the latter portion is in far better order and under a better system of arrangement of the Boats at their moorings, than I ever recollect to have observed, and the latter was unobstructed except for the largest class of timber Boats, between the 2nd and 1st Chokeys, for which at the very top of a high spring-tide there appeared to be an insufficiency of water. I shall venture to make a few remarks on the Canals, and trust to be excused by the Board should they not be considered strictly relevant to the subject they have proposed to me.

6. I came into Calcutta with a more than usually high spring-tide, driven in by a strong Southerly wind probably, the first turn of which I got at the western end of the Attara Banka about 10 A. M., and I carried it with me all the way to Calcutta, which I reached a little before 7 P. M. Up to Tardah the current was very strong, but after leaving the Eastern mouth of Tolly's Nullah, it had less velocity, though much more than I had ever experienced there, or should have expected to find in a Cut which has as yet no outlet into the great river. The water had however risen very little above the level of the edge of the banks anywhere, but as by numerous gaps it had access to the lower lands within, it ran off violently, submerging, but not deeply, a very extensive surface of country, a circumstance that might, it occurred to me, be turned to great advantage in the course of the construction of the new Canals.

7. It seems evident, that by bunding off the low lands, a measure that could not be attended with any considerable expense, and must be followed by the greatest benefits to the health of the community and to the commerce and agriculture of the town, the head of water in the Canal would be greatly increased, which is much required for the improvement of the Navigation, and the velocity of its current consequently augmented, which I conceive might be of great utility in carrying off filth, and by scouring the Cuts. This increased head would be perfectly under command with common flood-gates in the embankments, to allow the water to be dispersed over the morasses, should there be occasion to do so, which I do not foresee.

8. It strikes me also that the present wharfage is greatly insufficient for the Boats employed on the commerce, brought via the Salt Lakes, and although this deficiency will in some measure be remedied when the Boats can lie in the new Cut as well as in the Entally Canal, yet, I consider that a longer line of wharfage Eastward beyond Chingra-ghatta is very desirable, and this would be gained for the trade by the embankments I have suggested, were they made of a sufficient width for carts, which I think it would be good policy to effect at their first construction. The Boats now lying in the Entally Canal are obliged to be moored head on to the bank for want of room, but this necessity is much to be deprecated, as the section of that Canal is of such inferior width, that the large Boats can with great difficulty pass backwards and forwards when the bank is lined with Boats in that position, whilst their giving and taking cargo is greatly retarded from the want of good communication to the bank. Were the roads on either side continued to Tardah, these inconveniences would be entirely obviated, and the large Boats, whose cargoes are now brought up in smaller craft, could lie and land their cargoes wherever

it was convenient to them to do so, and the upper parts of the Canals would be greatly relieved of the number of Boats now so greatly obstructing the thoroughfare of the trade.

9. The large sea-going Boats, Mug, Burmese and others, never come up above Bhaminghatta from the want of water, but embankments would either enable them to come close up to Balliaghat or remove the inconvenience which now attends their lying at a place which has no land communication with Calcutta. This branch of the trade will be greatly extended from our improved relations with the eastern coasts, and it must of course be our policy to facilitate its extension by all expedient means, and I think a continuation of the Roads from Calcutta to Tardah by the Salt Lakes, and also from Gurriah-hath by Tolly's Nullah, would afford great facilities to the trade, at a very comparatively inconsiderable outlay.

10. Other collateral advantages would, in my opinion, result, especially with reference to the clearing of the wastes in the Sunderbunds, which from my own observations these two last seasons, I can announce is proceeding with great rapidity ; and this leads me to suggest the extension of the Roads I have already advocated to Badurtulao, a large timber mart, 5 or 6 miles below Tardah. Immediately South of that point commence the tracts now clearing by Europeans, and the national importance of the enterprize on which they have embarked their capital would seem to demand the assistance and attention of Government. I am not aware whether the Government has secured for the public the right of tracking and travelling by the boundary bounds of the several grantees, but I think that future difficulty might now, if that right has not been insisted on, be obviated by the prolongation of the Roads to Badurtulao, which would be of immediate and great benefit to all the neighbouring grantees, who would, I have little doubt for the favour, concede the right of thoroughfare, and probably enter into the views of Government, and continue and maintain good Roads along the fronts of their respective estates, for their own property will improve in value, as the adjoining properties improve, and good Roads and tracking paths will greatly conduce to the rapid advancement of all the tract now in course of being cleared and cultivated. There is nothing in the circumstances of the land here or of any part of the Sunderbunds that I know, which oppose more difficulties to the construction of good Roads than any other parts of Bengal, rather the contrary, for the comparative level of the lands is greater and nearly constant, the land floods being reduced to the tide levels.

11. I would beg to suggest to the Military Board whether it would not be expedient to widen that part of the Canal below Chingraghatta to about thrice its present width, and for a considerable distance, perhaps not less than a mile, and of sufficient depth to contain the largest class of lime and timber Boats, they would in that case all lie out of the way of Boats proceeding backwards and forwards, a desideratum much required, and the earth from the excavation would afford such good ground for the erection of Godowns, that I think all the expense of the additional cutting would be fully covered by the rent the Government would thence realize. A smaller excavation and in the form of a basin, would be a convenience to the community and also probably profitable to the Canals, as a haven to be solely appropriated for the very numerous fishing Boats that frequent that end of the Canal, it is desirable that this species of craft should have ready access to a good birth and lie out of the way of the great trading Boats ; the additional expense that would be entailed in effecting these objects would be, I conceive, fully covered by the rent of the lands, for a spacious Fish Bazar is an establishment much wanted by the Town.

12. I am not informed whether the Board contemplate placing lock-gates at the end of the Entally Canal towards the Salt Lakes, but I would beg to mention, that in my opinion such gates would be of great subsidiary utility, and specially if connected with a cross Cut to fall into Tolly's Nullah below and near Gurriah-hath by which the tides from

the Lake might be diverted, avoiding danger from their accumulation, should it be requisite to empty the Canal for any purposes particularly to cleanse it in any part, an operation which would be thus greatly facilitated. The cross Cut would be of extensive advantage otherwise, to that part of the Town, even were its dimensions much smaller than those of the new Canal, for as the large Boats will have by this a direct passage to and from the Hoogly, it would seem to be unnecessary to provide another passage for them, the local trade and Drainage of the South-eastern end of the Town being principally the objects to be attained by the cut, I now recommend.

13. I cannot conclude this letter without bringing to the notice of the Board the only real and a most serious obstruction to the more valuable part of the traffic proceeding by the Sunderbunds, that which passes Dacca, either proceeding to or from the Presidency. I allude to the existing necessity of proceeding for some distance by the united stream of the Megna and Ganges, which is pregnant with constant delay and the utmost danger to all common river Boats. My knowledge of that part of the country will not allow me to offer any other suggestion than the propriety of having Surveyed the lines of the Tagoorpore, Toolsey, and Churan Creeks (Rennell's Atlas No. XII.), or other present Nullahs, with the view of ascertaining whether at an expense not inordinate to the advantages proposed to be gained the above truly serious part of the Navigation might not be saved. The great rivers now effect their junction more than 20 miles above the point at which they joined in Major Rennell's time—the Navigation from Dacca to Burrisal is in consequence now totally altered and is still changing, an alteration that has been attended with enormous destruction of property, and which promises to occasion yet greater losses before the streams have worked out a sufficient and a fixed Channel. Government, I apprehend, can do nothing to avert the threatened calamities, but it seems to be a matter of regret that no attempts have been made to improve the Navigation from Dacca to Burrisal by cross Cuts, nor to correct the Charts, (published in 1780,) to the existing state of the Channels now navigated from Culna [? Koolna] to Dacca.

14. The great value of the traffic that comes through the Sunderbunds, the total inadequacy of Tolly's Nullah and the Entally Canal, to allow the immense tonnage employed in its transport to pass backwards and forwards, and to reach convenient wharfage at Calcutta or in the Suburbs, and the probability of this trade being shortly greatly increased by the extension of cultivation throughout the wastes of the tract in question, are topics on which I need not enlarge in addressing the Military Board, they seem most urgently to demand the completion of the improvements now in hand under their direction, and the entire and vigilant attention of a Superintendent to conduct and maintain those works, and promote measures for further facilitating a commerce of vast and growing importance.

(True Copy,)

G. YOUNG,
Secretary Military Board.

No. 89.

No. 97.

FROM THE MILITARY BOARD.

TO THE HONORABLE SIR C. T. METCALFE, BART.,

Vice-President in Council.

Fort William ; 1st May, 1832.

HONORABLE SIR,

Department of Public Works.

A Report from Captain Jenkins,
on the Canals in the Sunderbunds
and on the Entally Canal.

We have the honor to submit, for the information of Government, the annexed copy of a Letter dated the 16th ultimo, from Captain J. Jenkins, submitting observations on the new Canals in the Sunderbunds and on the Entally Canal

2. The above Report contains information, which may hereafter prove useful.
3. We have furnished the Superintendent of Canals with a copy of this document.

We have the honor to be,

Honorable Sir,

Your most obedient Servants,

T. ANBURY, *Col. Chief Engineer.*

A. GALLOWAY, *1st Col. M. M. B.*

D. McFARLAN, *Chief Mag. and M. M. B.*

J. McKENZIE, *M. M. B.*

No. 90.

No. 570.

TO THE MILITARY [BOARD.]

Miscellaneous Revenue.

GENTLEMEN,

24th April, 1832.

I am directed to acknowledge the receipt of your Letter dated the 3rd instant, on the subject of the Eastern Canals.

His Honor in Council concurs with your Board in thinking Mr. J. Prinsep's Report on the whole satisfactory and creditable to him.

The application you have made to the Harbour Master's Department for the use of a Boat to remove the roots and stumps of trees in the Mofussil Canals is approved. The expense will of course be charged to the Canals.

The object contemplated in the erection of dams or wears at the mouths of the city Drains is important, and his Honor in Council desires that a Report may be hereafter furnished on the success attending the one, which has been ordered to be experimentally constructed.

The several Bills submitted with your Letter are passed, and here returned with the usual endorsement.

I have &c.

(*Sd.*) J. Y.

P. S.—The other original Papers submitted with your Letter under acknowledgement are likewise returned, copies being kept for record.

(No. 91. to No. 94. inclusive omitted.)

No. 95.

No 144.

FROM LIEUTENANT-COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces,
To CAPTAIN G. YOUNG,
Secretary Military Board.

SIR,

Barrackpore, 14th June, 1831.

With reference to your Letter, No. 222, of the 17th ultimo, I have the honor to enclose copy of a Report No. 326, by Mr. Prinsep, on the effects likely to be produced on the Drainage of Calcutta, by opening the proposed communication between the Circular Canal and River at Chitpore, from which it appears, that no detriment whatever is to be apprehended from the proposed communication through a Lock passage, which can be closed, as occasion requires, during the rains, and, that were it even thrown open during that period, no more inconvenience would ensue than has hitherto been occasioned by the Marhatta Ditch.

I have the honor to be,

Sir,

Your most obedient Servant,

R. TICKELL, *Lt. Col.*,

Superintending Engineer, Lower Provinces.

No. 95. a.

No. 326.

FROM JAMES PRINSEP, ESQ.,
Superintendent Canals.

To LIEUTENANT-COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces.

SIR,

Calcutta, 5th June, 1831.

I have the honor to acknowledge the receipt of your Letter No. 239, dated the 25th ultimo, directing my attention to the subject of the alteration of the level of the Circular Canal likely to ensue upon opening the communication at Chitpore with the River Hoogly, and the consequence thereof to the Drainage of the City.

2. It need not be pointed out, that the scheme proposed for the Circular Canal, never contemplated leaving open this communication during the rainy season, indeed it has been deprecated from the commencement, since, even if no inconvenience were likely to accrue to the Drainage, such damage would inevitably ensue to the banks and bed of the Channel from the velocity and turbidity of the river water as would soon completely destroy the main objects of the Canal—permanency of section and depth.

3. But I presume the case is only put as a possible contingency, and it will be always advantageous to be prepared for such ; and to know beforehand, as far as the intricacy of the subject will admit, what might be the consequences of leaving the passage open to the freshes.

4. It occurs to me that the clearest mode of investigating the subject theoretically, will be to pass under review all the circumstances of variation of level and trace the concomitant effects upon the velocity, slope, and level of the Canal at its midway course, or between the Narkooldunga and Bythukhanah Bridges, which is also the medium position of the system of Drains.

5. The utmost difference of level between the River and Lake being about 10 feet, we have the several intermediate

Differences of level.

0	ft. 1	ft. 2	ft. 3	ft. 4	ft. 5	ft. 6	ft. 7	ft. 8	ft. 9	ft. 10
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And assuming the length of the Canal to the point where its waters expand in the Lake to be 6 miles, we obtain the

Slopes of the Surface.

1	1	1	1	1	1	1	1	1	1	1
31,630	15,840	10,560	7,920	6,340	5,280 ⁽¹⁾	4,525	3,960	3,409	3,168	

Remarks in pencil on this Paper by a Member of the Military Board, P Col. A. Galloway. —J. M.

(1) ? 2,630.

Now the average section of the Canal being $\frac{60+60}{2} \times 9$ ft. = 585 feet, and the border about 84 feet, the hydraulic mean depth deduced, is 83.6 inches, and the

Velocity⁽²⁾ corresponding with the above Slopes.

Inches per sec. } or Miles pr. hour. }	15.7	20.2	25.7	30.1	34.2	37.9	41.3	44.5	47.6	50.0
	0.9	1.2	1.5	1.7	1.9	2.2 ⁽³⁾	2.3	2.5	2.7	2.9

(2) Captain P's. velocity is $4\frac{9}{10}$ miles an hour.

(3) 4.4.

And the Quantity of water delivered per second will be

milli. C. Inches.	1,340	1,680	2,160	2,520	2,856	3,192 ⁽⁴⁾	3,444	3,738	4,032	42,000,000 C. In.
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(4) 6,381.

which sums divided by the area of the entry or Lock Basin (increasing it in proportion to the depth of water) will give the velocity of the water in passing through the Sluice passage, the section at the Zero of levels is 24×8 , and the border 40 feet, therefore we deduce

The velocities required to maintain the Canal discharge

Inches per Sec. }	43.2	43.6	57.0	60.8	63.6	65.3	71.2	74.6	77.8	80.0
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and these velocities will require a slope in the Sluice Channel (which we may call 300 feet at least in length) of

Inches.	1.0	1.2	1.4	1.6	1.8	1.9	2.1	2.3	2.4	2.5
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but they will also require a head of water for their production; since the River may be regarded as a stagnant Reservoir—this

Head of Water Estimated as $\sqrt[5]{2}$ will amount to

Inches.	3.7	4.8	6.5	7.4	8.2	8.8	10.1	11.3	12.1	13.0
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so that the total *difference of level* required for the maintenance of the velocity and slope of the Canal as given above, will be

ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
1-4.7	2-6	3-8	4-9	5-10	6-11	8-0	9-1 $\frac{1}{2}$	10-2 $\frac{1}{2}$	11-3 $\frac{1}{2}$	

and for these several conditions the surface of the Canal midway or near Scaldah would be on the standard tide gage

ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
+2-6	+3-0	+3-6	+4-0	+4-6	+5-0	+5-6	+6-0	+6-6	+7-0	

or assuming the level of the *Circular Road* at nine feet⁽⁵⁾ above zero, there will be left a depth in the several Drains to carry off the rain

ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
6-6	6-0	5-6	5-0	4-6	4-0	3-6	3-0	2-6	2-0	

(5) It is 12 feet.

The two last columns, wherein the height is beyond 10 feet, may be rejected from consideration, and even the next two must be taken as extreme cases, for the river is but a short⁽¹⁾ season at its greatest elevation, and the effect of the ebb has been entirely omitted in the above calculations.

6. I think therefore we may assume safely (+5 feet)⁽²⁾ as the *utmost* mean daily level of the Canal during the freshes, supposing the communication were left open through one lock passage without impediment, this would bring the Canal water up to the floor of the Bytukkhanah Drain, and a foot or two above the other Drain floors; but the capability of a Drain to carry off water must not be estimated so much from the floor, as from its general depth from the surface of the ground; it cannot be said that the Drainage is suspended, until the Canal is level with the Road, which cannot obviously take place while the Salt Water Lake has a free vent to the south.

7. But in a practical way, and perhaps therefore more satisfactorily, than by a vague theoretical view, good information as to the consequence of opening the Circular Canal to the River, to the Drainage of the Town, may be sought from the parallel⁽³⁾ case of Tolly's Nala.

8. This Nala has not the advantage⁽⁴⁾ of a level Lake surface to centralize the effect of the water poured in; none of the impediments at its various Bridges are equal to the proposed contraction at the lock entry of the Canal, and yet from the temporary lift of the tide during the freshes, twice a day, the utmost effect beyond Allipore Bridge (distant $1\frac{1}{4}$ mile) is to raise the level of the Nala 7 feet 10 inches above the mean level of the River, although there is in this case no obstruction at the mouth, such as would be caused by the contraction of a lock passage. At Tollygunge, distant 4 miles, or about as far as the junction of the Circular and Entally Canals, the maximum rise is only 5 feet above the mean⁽⁵⁾ level; so that it may be confidently argued that, in any case, the cills [? sills] of the Bythukkhanah and Dhurmtullah Drains would remain unaffected. Gurryahat, distant 7 miles, has a rise of $4\frac{1}{2}$ feet, and may be compared in relative situation with the 2nd Chokee on the Lake Channel, but in the latter place, from its capability to spread over a large surface, the rise would necessarily be greatly less: indeed the late Superintendent in a memorandum on this subject, drawn up I presume for the Canal Committee, computes the rise of the Salt Water Lake⁽⁶⁾ from the action of the Canal, supposed open, at not more than six inches.

9. I beg leave in conclusion to refer you to my brother's several communications on the question now referred to myself, and to explain that, although I agree with Major

Remarks in pencil on this Paper by a Member of the Military Board ? Col. A. Galloway.—J. M.

(1) Yes, but one day's damage might be irretrievable.

(2) Five feet—yet the difference of level is stated at 10 feet, but is in reality 12 feet.

(3) This is not accurate. This is an egregious error! There is nothing similar. See following note. ♦

(4) "Advantage" indeed! why it is this low and level Lake which is so sure to increase the current through the Canal, and it is the length of the contracted passage of Tolly's Nullah which creates the impediment to the current, the water having consequently no power of sudden expansion, is kept at a height throughout, and finds its way with difficulty; not so the Canal with the Lake as an outlet, so that this is the very reverse of a parallel.

(5) It will not do to take *mean* any thing—but the highest level of the River to guard against danger. It is not the *mean* velocity of wind, but storms which are dangerous.

(6) We have nothing to do with the rise of the Salt Water Lake—except in so far as its not rising will obviously make the current through the Canal the stronger, by giving an infinitely greater declivity.

Schaleh and himself in the impropriety of leaving the communication open, still as far as regards the mere Drainage of the Town, I do not think that very great detriment* would ensue; not more than must always have been experienced in the neighbourhood of the Sham Bazar, where the level of the Marhatta Ditch in the rains must have been at times nearly even with the Road.

* See Papers marked No. 9 (page iv) No. 12. No. 13. No. 13. a. No. 38. No. 381, and No. 96.—J. M.

I have, &c ,
(Signed) JAMES PRINSEP,
Superintendent Canals.

True Copy.
R. TICKELL,
Superintending Engineer, Lower Provinces

No. 95½.

No. 367.

To CAPTAIN GAVIN YOUNG,
Secretary to the Military Board, &c. &c.

SIR,

I have the honor to acknowledge the receipt of your Letter dated the 22nd instant, enquiring the cause of my delay in replying to your Letter of the 9th August last.

2. The Letter in question desired me to advert in my report on the subject of the Lock-Gates, to the point of "what time would be taken to fill the chamber of the Lock in the passage of Boats to and fro." I beg to explain that I considered the Letter as a Memorandum to which advertence should be duly made when my plan should be transmitted to Colonel Tickell, and not as calling in any way for a direct or immediate reply, which could not in fact be given until the dimensions of the Sluice, &c. were finally resolved upon.

3. It had been customary to send in Plans and Estimates along with the annual Reports and accounts of the office, and it was my intention to have done the same. I regret, however, to acknowledge that the accounts are considerably delayed this season, partly from the circumstances of the usual monthly accounts having been suspended by order of the Board, and directions given that the accounts should be made up at the close of each work. They are now, however, nearly ready, and shall be transmitted without delay.

4. I beg to submit for the information of the Board, that the alterations which I purposed introducing into the Plan of the Lock-Gates, are but slight modifications of the original Plan, which having been submitted along with a model, to the late Canal Committee, and having received their approbation and the sanction of Government, I felt it less imperative to devote my attention to the revised Plan, having plenty of time before me ere the excavations (already commenced) will be ready for the foundation to be marked out.

5. Should the Board be desirous to see my Plan, before it goes to the Superintending Engineer, I shall be obliged by your favoring me with their orders to send it direct, as upon former occasions, I have had the misfortune to incur their displeasure for doing so.

I have the honor to be,

Sir,

Your most obedient Servant,
JAMES PRINSEP,
Superintendent Canals.

CANAL OFFICE:
26th November, 1831.

No. 96.

Minute upon the Paper marked No. 95. a. by LIEUTENANT COLONEL GALLOWAY.

13th July, 1831.

I should be glad could I take the same view of this question which is taken by the Chief Engineer; if indeed that view be adopted on the supposition of the river being admitted to flow into the Canal. On that supposition, notwithstanding Mr. Prinsep's Hydraulic calculations, which by the bye are founded on inaccurate data, notwithstanding what Mr. Prinsep has written, I confidently agree with Captain Schalch and Captain Prinsep, that the admission of the river would in the rains impede, and during the high tides of the freshes, entirely obstruct the Drainage of Calcutta.

But we are told that the Marhatta Ditch on one side, and Tolly's Nullah on the other, do not injure this Drainage! What is the fact? The principal Drains of Calcutta, do not fall into Tolly's Nullah. But if they did, what then? Why it has been found necessary to put sluices on the inlets from Tolly's Nullah at Bowaneepore, and on the Marhatta Ditch near Baugbazar, not merely to protect the Drainage, but in order to preserve the Town from inundation! "At Bowaneepore (says Mr. Bleychenden) there are sluices for the purpose of keeping the water from Tolly's Nullah out of the Town," surely this is known to the Board? What then, is the use of Hydraulic calculations, to shew that the river, if admitted into the Canal, would not injure the Drainage of Calcutta, when we positively know, that if it were not for sluices, the water from the inlets already in existence, would not only stop the Drains, but would inundate the streets. Thus so widely have facts been overlooked, that the instances of Tolly's Nullah and the Marhatta Ditch, which have been quoted in support of Mr. Prinsep's theoretical calculations, must be quoted against them.

Mr. Bleychenden's
[? Bleichynden]
Report, 14th Feb.
ruary 1831 *Supra*.
page xvii No 13. a

Another very heavy mistake in Mr. Prinsep's Report, will not have failed to attract notice in Par. 5, in which he states, "that the utmost difference of level between the River and Lake being about 10 feet, we have, &c." Whereas Captain Schalch, whose levels are admitted by all to be perfectly accurate, says distinctly—"The Hoogly rises *upwards of 12 feet above the level of the lake*," and both are speaking of the same period—the rains; of what use then are calculations founded on such oversights as these. Mr. Prinsep in his calculations again assumes the level of the Circular Road to be 9 feet above the Lake; but Captain Schalch gives the level of that Road to be at Ooltadanga, "11 feet above the Lake in the rains"—"and the surface of the water in the Canal, in the rains, would be at this place, at high-water, *a foot and a half above the level of the Circular Road*."—And are Drains which pass *under* this Road, not to be affected by the Canal? Captain Schalch adds "and as the river at that season does not frequently fall 10 feet, there would be no possibility of Draining this part of the Town into the Canal, if the river flows into it"—again, "at the Eastern extremity of Bow-Bazar Street, in the rains, the highest rise of the tide in the Canal will be *on a level with the Road*."

Captain Schalch's
printed Memoir
See Appendix to
Appendix (G),
page xvii.

Ibid, page xx.

Ibid.

Ibid

Ibid, page xxi.

"Without the Lake (Captain Schalch goes on to say; that is, without the fall of level it gives) the greater part of the Town would be under water for three months in the year: without it many of the most populous streets after a heavy fall of rain, would be 3 feet under water; and it might so happen that in some there would be a depth of water above an ordinary man's stature"—Captain Prinsep has also clearly expressed his opinion that the Drainage of Calcutta would be deranged by the admission of the river into the Canal. It is therefore idle, I conceive, after having shewn that Mr.

James Prinsep has stated inaccurate levels and other data imperfectly,* to add that his calculations founded on these must be erroneous.

It is idle, I conceive, to shew beyond the mere statement of the fact, that if the bottom of the Calcutta Drains at the Circular Road, as stated by Mr. Prinsep himself, be in some cases only 1 foot 4 inches, in others 2 feet 3 inches, or 3 feet 1 inch, &c. above the water in the Canal now, before the river is let into it, you cannot let much more water into that Canal without its affecting those Drains. Yet it has been shewn, that the river would, if it were let in, rise there *full 11 feet* higher than the water now is; that is, 11 feet higher than the level of the Lake (which is now that of the Canal, and which will continue to be so if not cut through into the river), higher indeed than the streets under which those Drains run. Mr. Prinsep's reasoning on the contraction of the Channel by means of the narrower chamber of the Locks, is perfectly just in the Abstract; but like much more theory, it is inapplicable: and to this Canal quite imaginary, since you dare not open this narrowed channel to the weight of 12 feet water before it, without creating such a torrent through it as would undermine the sill and tail of your Locks, and utterly destroy them in a single day.

On the other hand, nothing can be so favorable for the Drainage of Calcutta as the Canal in its present state. Cleaned out, *but not Cut into the River*, its level can never rise above that of the Lake, the Drains fall into it immediately, instead of having to wander each by a devious narrow Channel to the Lake, at a great distance, with corresponding obstructions to its flow. It is tantamount to bringing the Lake to the very verge of the city, without the city being exposed to its pestilential vapors, and the whole Eastern and Northern circuit of Calcutta is open (to within a few hundred yards of as much as it can be made by cutting into the River) to the whole of the Eastern Navigation. Here then, has every point of benefit to Calcutta aimed at, been gained (without any manner of risk) except one, namely the passage, at the particular spot of Chitpore, from the Hoogly through the Sunderbuns. This has not been opened. What then? why, by going down the River from Chitpore to Tolly's Nullah, about *four and a half miles*, I meet with a passage infinitely superior to this Canal, free from all the impediments of Locks: and if I desire to proceed by the Eastern line of Canals (should they be open), I have only to go $4\frac{1}{2}$ miles from Tarda, and I get into the mouth of these Canals, having just escaped the shoals and the baffling winds, and the lee-shore of the Salt Water Lake. Thus every advantage is obtained; every risk avoided.

But another question has now arisen out of these Reports. We are now told that "the communication by the Canal, when Cut through into the River, is not to be left open during the rainy season; for, if it were, the velocity of the current would destroy the Canal." This is Mr. Prinsep's account in these Papers; and I am glad to find that "the communication is not to be left open," because it removes several objections which were offered by me to carrying on this Canal into the River. And I may here express my satisfaction, that the objections which were made by me to the former Plans and model of the Lock in question, as exhibited to the Board, have occasioned, as I am informed, a revisal of those Plans, &c, which are now found to be imperfect. I have reason to believe that revised Plans for Locks of a more solid and substantial and better form, have been, or will be, prepared. This is so far well.

These will doubtless be brought before the Board. But, after what has been written on this Canal; and after the advantage of possessing a free communication with the River

* Note—So indefinite are all these calculations, that I observe for a slope of 10 feet, Mr. J. Prinsep gives the current a velocity of 2.9; whilst Captain Prinsep for 8 feet gives a current of 3.4!!! See Par. 16. Memoir by Captain Prinsep, Appendix (H) page 82.

at all seasons, has been so fully expatiated upon, must we not now go up and tell Government what we now understand that this Circular Canal was "intended to be:" for it now appears, according to Mr. Prinsep, that "*it never was intended*, that during the rains this communication should be left open; and that it could not without destroying the Canal itself." It is likewise stated by Colonel Tickell, that "the Canal is to be shut to navigation for two or three months in the year." So also in a subsequent Minute by Colonel Craigie, I observe it stated (Circulation 18th April) "that the Gates at Chitpore were never intended to be opened during the height of the rains, they are of the description called by the Chief Magistrate, Flood-Gates: and that this is quite obvious on an inspection of the model sent to the Board. The communication with the River during the dry weather was certainly a great improvement on the original Plan, introduced by Captain Prinsep, and approved by the present Superintendent." And other Members of the Board appear to have taken up this view: now this is all new to me. This is not the Canal brought under the consideration of the Board, this is not I apprehend the Canal which Government has authorized the Board to proceed with to completion. This is not Captain Prinsep's Canal. Captain Schalch is (not Captain Prinsep) the author of the "improvement of the communication with the River during the *dry weather* ; but Captain Prinsep is the author of the plan for *keeping up the communication during the rains*. There is a whole Chapter by Captain Prinsep on what is termed "manœuvring of the Gates;" and he distinctly says—"The adoption of this method "of artificial navigation will *secure a daily intercourse with the River during the rains*." Captain Prinsep even contrasts Captain Schalch's Plan of *closing the Canal to Navigation in the rains* with his own. He says, "Captain Schalch observes that the stability of the other Canals is built entirely *upon their not being exposed to the freshes of the River*"—(Captain Prinsep's Reports) but I submit a plan by which you secure "a daily communication with the River" throughout the year! Are we then to be told at the eleventh hour, after the plan of opening the Canal Navigation in the rains has been sanctioned by Government, that "it never was intended to be so opened?" I, for one, have been writing with reference to *Captain Prinsep's Plan*. At that period we heard of none other. I also presume that Government has founded its decision, contemplating the execution of that Plan, and no other.

This is a question, therefore, which must be submitted to Government, who will now see that the communication which before they conceived was designed to be complete throughout the year, is to be so but for three-fourths of that period! Government should also be informed that the old Locks which in our former proceedings were contemplated, are now discovered to be imperfect, and that a new plan is under preparation, which doubtless will be attended with additional expense. It will not do for the Board to carry on one scheme of work, whilst the Government have sanctioned another.

The utility of the work having thus been diminished, whilst its expense will be materially increased, before we proceed farther, these points must, I apprehend, be submitted for the consideration of Government. We ought further to consider, since it now appears that only a very diminished strength of current can be admitted from the River, how we are prepared to keep the Canal open from the immense deposit brought into it, not only by the turbid water of the River, but especially by the Calcutta Drains. Further, but supposing we can throw into it a current sufficient to keep it at a navigable depth, whilst it is confined within its own regular Channel and section, how are we prepared to prevent the matter from settling, when this force of current is lost by entering into the extended surface of the Lake. This appears a dilemma. We must have a strong current to prevent the Canal from being choked up. But, if we admit a strong current, we destroy the Canal, and thus, both with and without a current, it must be destroyed.

These are points which should have been brought to the notice of Government with the original proceedings of the Board, on the further prosecution of the Canal ; but it is not too late.

Nor is it too late to submit for consideration, another very important point connected with the junction of this Canal with the River : a point which has not hitherto been brought to the notice of Government, notwithstanding all those voluminous discussions ; and which I take great blame to myself for having overlooked.

We have seen that the River in the rains rises 12 feet above the Salt Lake. For the rest of the year, that is, for 8 months, however, the level of the River is considerably lower than that of the Lake ; so much so, that probably for the greater part of the ebb, the current will set from the Lake into the River.* The extreme low-water mark of the Hoogly is found to be $8\frac{1}{2}$ feet below the surface of the Lake. Now it must be obvious, that as the Canal and the Lake are the common cesspools, into which are thrown the impurities of this immense city : and moreover, as the water in the Salt Lake is within a few degrees of being as salt as it is at Saugor, the quantum of salt water and impurity brought into the River, during an ebb of 7 hours duration, from the Lake and Canal, must be very great. This is an evil of great magnitude to the poorer inhabitants of Calcutta. They are obliged to have recourse to the River for water ; and if the Canal be opened, they will be compelled to drink a brackish mixture, polluted with the impurities disgorged by the Calcutta Drains. This will be a frightful addition to the present impure state of the River water of the city. Nor, I am afraid, can it be obviated ; for, coming into the River on the same side, and just above the town, the water from the Canal will float down the verge of the Bank for a great distance without even mingling with the stream, and thus keep its position in shore, where alone water is accessible. I cannot indeed conceive any thing more grievous to the poorer inhabitants of Calcutta, and population afloat on the River in Boats, and in the Shipping off Town, who are beholden entirely to the River for the water they use, than to have the water they must drink thus polluted.

The following will be the state of the Circular Canal. In the rains it must either be shut up altogether, or it will damage the Drainage of Calcutta ; and at all other times we shall have it pouring into the comparatively pure and sweet water of the River, the refuse of the Calcutta Drains, floated into it by the salt and slimy water of the Lake.

But I shall beg leave to assume that Government did not intend to lay out Lacs of Rupees on a Canal to be shut to navigation for a considerable portion of the year, and for the rest of that period to pollute the purity of the River from so pernicious a source. Among the "advantages" and "disadvantages" of this costly undertaking, we have unfortunately omitted all this. But I am told we are to have Locks ; and as they are to be shut, *to exclude the River in the rains*, so they may be kept fast *to save the River from pollution at other times*. True ; and they must be shut up so as to do so. But then, as I have before said, this is not the Canal we have described to Government. It is now confessedly shewn of its utility : its influence, as now shewn, must be noxious to the inhabitants of Calcutta : and if I am to judge either from what I have been given to understand, or by the Diagrams of Double Locks on the margins of our Minutes,† the former Plans for completing this part of the Canal are approved of by no one ; whilst alterations, to be of use, must inevitably incur a heavy unlooked for expense. I propose therefore, that these documents be submitted for the information of Government, for, as I have before said, this Board cannot, unknown to the supreme authority, continue to prosecute a plan differing essentially from that which was sanctioned by Government, whilst our doing so would burden the State with additional expenditure. Meantime Mr. Prinsep should be required to furnish, without delay, the Plans on which he actually designs to execute the work.

A. G.

* "From the lowest fall of the River to high-water mark in neap-tides, in February, is 8 feet."—Kyd's Tables. In February the River is about its lowest, so that the current will, at neap-tides at all times, set from the Lake then.

† See Diagrams on separate sheet inserted opposite page lxvii.

J. M.

Military Board's
Proceedings, 17th
May 1831.

*Minutes of the Members of the Military Board, with reference to the
Papers marked No. 28, No. 34, and No. 37 a., in this Appendix.*

Minute by Col.
Sir T. C. Anbury.

I am quite satisfied with Colonel Tickell's Report.

(Sd.) T. A.

Minute by Col. A.
Galloway.

This Report is very clearly and distinctly drawn up, and is satisfactory in so far as we now find that Boats can pass in 60 hours through the line of Canals as far as Balliahghat now at least. Colonel Tickell I believe, however, had the advantage of spring-tides for part of the way. His account however, of the set and sluggishness of tide in some parts leaves but little hope of the permanency of the work. In 60 hours there are five Flood and as many Ebb Tides. I think Mr. Prinsep reckons three Floods as sufficient by the old (Tolly's Nullah) route for heavy Boats. Colonel Tickell very justly remarks, that the Eastern Canals may be considered separately from the Circular Canal. In this view I should not object to a moderate sum being laid out in improving the Eastern Branch: and could it be done permanently, I would lay out money on it rather than on the Circular Canal, which, as a passage into the Hooghly, has no value: since by dropping down to Tarda, a distance of $4\frac{1}{2}$ miles from the mouth of the Eastern Canals, you get into the route by Tolly's Nullah. I was not aware before of the necessity being admitted of keeping the Locks at Chitpore shut altogether for three months in the year.

This Report should be sent up to Government I think without any delay: the Board (at least the majority who have recommended the prosecution of the Circular Canal), should inform Government without a moment's delay, whether it was a Canal that should be open to navigation at all seasons, or one "to be shut to navigation for two or three months of the year," that was designed by them to be recommended.

A. G.

Minute by D.
McFarlan, Esq.

This is a fair and impartial Report, and valuable on that account. The speed of one passage compared with another in which there are so many Tides, must depend somewhat upon accident, and somewhat upon the watchfulness and alertness of the Boatmen passing through it, and the criterion after all is the disposition of travellers in general to prefer the one to the other. That they prefer the new is indicated in this Report, and in Mr. Prinsep's former ones, and has been stated to me both here and at Jessore, by persons competent to judge: therefore I conclude that no cause has been shewn why Government should regret that the work has been done.

No time should be lost in clearing tracking paths. With reference to Col. Tickell's remarks on the shutting up of the Chitpore entrance, an immediate explanation should be called for. The very nature and design of Locks is, that Craft should be lowered down, or raised to a different level as the exigency might require. If the work is not so constructed the Gate will be only a Floodgate, a very different piece of machinery from what I understand by a set of Locks. By them a vessel may be lowered down the side of a sloping country. How much more easily, from the level of the Freshes of the Hooghly to the pre-adjusted level of the Circular Canal?

D. McF.

Minute by Col. J.
Craigie.

This is a satisfactory Report, inasmuch as it confirms the facts and opinions communicated in Mr. Prinsep's Reports, and shows that the Board came to sound conclusions in recom-

mending that the Canals to the Eastward should remain untouched for a few years, until the extent of their success can be satisfactorily ascertained, and in directing the prosecution of the Circular Canal to completion with the utmost vigour. This Report, with Mr. Prinsep's late one of the 15th April, should be submitted to Government, with the expression of the Board's opinion that these documents strongly confirm the soundness of the views expressed by the Board in their late Report on the subject of the Canals. The information which the Chief Magistrate has attained as to the utility of the new Canals might also be communicated to Government.

The Gates at Chitpore were never intended to be opened during the height of the rains, they are of the description called by the Chief Magistrate Floodgates. This is quite obvious, on an inspection of the model sent to the Board. The Circular Canal would retain much of its advantages if constructed without any opening into the Hooghly as originally intended; but the communication with that River during the dry weather, was certainly a great improvement on the original plan, introduced by Captain Prinsep and approved by the present Superintendent.

J. C.

Col. Craigie's remark is quite correct. The works at the Chitpoor end of the Canal have hitherto been described as Floodgates *not* Locks, as quoted by Col. Tickell and supposed by me.

Minute by D.
McFarlan, Esq.

Having turned the matter over in my mind I cannot discover any reason why we should not have locks. Engineers may perhaps be able to show the impracticability of the scheme, but it has taken such fast hold of my mind that I venture to explain my views to the Board, and especially to the Chief Engineer, should no manifestly insurmountable obstacles occur to him, we might call for a Report on the subject through Col. Tickell from Mr. Prinsep.

When the level of the River is higher than that of the Canal, **BB** only would remain shut—Craft might enter into the space between **AA** and **BB**:—if they wished to pass, **AA** would be shut, and the water lowered to the Canal level.

The same process with **CC** and **DD** when the Canal level was higher than the River. To this general scheme I cannot devise any objection, nor do I see why it should be much more expensive than Captain Prinsep's:—his plan has four Gates.

It would not be necessary to have the work so made as to admit of egress into the River at every possible state of the tide, should it appear that that measure would be inordinately expensive.

D. McF.

The scheme as shewn in Mr. Prinsep's model is evidently intended to be Floodgates only. I am of the same opinion as Colonel Craigie, that the Canal would not suffer in its advantages was there not to be an opening to the Hooghly; but I conceive that its advantages would be enhanced by, and that it would be a principal object of convenience, having open navigation for Craft from that River, above the Town, into the Salt Water Lake and Eastern Canal, averting the necessity of going through Tolly's Nullah at any time: to secure this at all seasons of the year I am decidedly of opinion, that Locks would be preferable and necessary, the only objection that I am aware of against them, is, their heavy cost. By Locks the communication from the Hooghly with the new or Eastern Channel might uninterruptedly be kept up at all seasons of the year, independent of the levels of water in either, and by adopting locks, I conceive, the advantages of the Canal would be, as before observed, considerably increased.

Minute by Col.
Sir T. C. Anbury.

By the means of Locks the Craft using the Canal, might be lifted into the Hooghly at the highest state of the River (i. e. in the rains,) without reference to Ebbs or Floods, or dropped

into the Canal at the same season, independent of the state of the water in the Canal, or level of the Lake. To the construction of Locks I am not at this moment apprehensive of, nor do I contemplate any impediment; and had I been the Executive in this work, I certainly should have strongly recommended Locks, and which was my original opinion, as being the best method of opening the Canal to the River above the Town. The Board I am persuaded are so sufficiently acquainted with the nature and superior advantages of Locks in a navigation through conflicting levels, as not to require any illustration by a diagram to show the method of raising Craft from the lower to the higher levels, and vice versa.

Perhaps a double Lock as described by Mr. McFarlan, might not be absolutely requisite, since the body of water in either column would never be more than could be sustained by a pair of strong single Gates with proper Vanes, which would be constructed in the Gates, and which would let in and regulate the column of water required to lift the Boats from the lowest to the highest level.

If the Canal is to be connected with the River, I recommend Locks and a free ingress and "egress at every possible state of the Tide."

Boats coming into the Canal from the Hooghly, would present themselves at **A A**, the Vane of these Gates being opened would raise the water to the level of the Hooghly, the Gates are then opened, and the Boats' position would be at **A A**. Gates are then shut, and by the Vanes in **B B** the level is reduced to that of the Canal, where they are opened, and the Boats passes into (1), when if she is lower than the level of the Canal, the Vanes of **D D** and **C C** are opened and the level of the Canal obtained: when both are opened, and the Craft enters the Canal, and *vice versa*, an equalable level is obtained for the River.

(*Sd.*) T. C. A.

Minute by Col. A. Galloway.

Until I read the above Minutes I certainly was not aware after so protracted a description, that the Board were not agreed as to what description of Canal this Circular Canal was proposed to be. I find however that the Members of the Board do not yet agree as to what Captain Prinsep's scheme was. Colonel Craigie says, "the Gates at Chitpore were never intended to be opened during the height of the rains: they are of the description called by the Chief Magistrate Floodgates, that is, quite obvious on an inspection of the model sent to the Board." "The Circular Canal would retain much of its advantages if constructed without any opening into the Hooghly as originally intended; but the communication with that River during the dry weather was certainly a great improvement on the original Plan introduced by Captain Prinsep* and approved by the present Superintendent.

On this the Chief Magistrate observes, that Colonel Craigie's remark is quite correct. "The works at the Chitpore end of the Canal have hitherto been described as Floodgates, not Locks," and the Chief Engineer adds, "the scheme, as shewn in Mr. Prinsep's model, is evidently intended to be Floodgates only."

If by this it be intended to embrace the opinion expressed by Col. Craigie above, that "the Gates at Chitpore *were never intended (by Captain Prinsep) to be opened during the height of the rains,*" then certainly a misapprehension has taken place of Captain Prinsep's intentions: that gentleman having written many pages to show the advantages of his own scheme over that of Captain Schalch, by keeping the passage into the Hooghly open to navigation throughout the year! There is an whole essay† on what is termed "manœuvring the Gates." He tells us "the adoption of this method of artificial navigation (by means of his Gates) will secure a daily intercourse with the River throughout the year." That Captain Prinsep's Plan may be a bad one is another question, I think it so, and I have long ago objected to it, but his object is undoubted. If therefore the opinions of the Board already before the Go-

† See Appendix (H) No. 89, a.

* The communication with the River during the dry weather was an improvement not by Captain Prinsep I believe, but by Captain Schalch!

vernment, have been formed under an impression, that by the proposed scheme the Circular Canal *was not intended to be open to Navigation during the height of the rains*. Captain Prinsep's Scheme did in point of fact contemplate the Canal to be open to navigation throughout the year, at least for several hours daily, even in the height of the rains. It will perhaps be deemed necessary to afford some explanation to Government of the misconception.

Had I imagined that the Canal was not to be opened during the rains, it would have in a great measure removed some of the most obvious objections to it. But Government should not remain uninformed as to the different views, in this important particular,* we have severally taken of the subject.

A. G.

* I call the question of opening or not opening to Navigation the Circular Canal in the height of the rains important, because it is the only part of Captain Schaleh's scheme of consequence, from which Captain Prinsep departs, whilst Captain Schaleh, as quoted by Mr. P., explicitly states, that *the stability of my other Canals is built entirely upon their not being exposed to the Freshes of the River*.—A. G.

No. 96½.

Minutes of the Members of the Military Board, with reference to the Papers marked Nos. 95, 95a., 95½, in this Appendix.

Military Board's
Proceedings, 10th
July 1832.

I am quite of Mr. Prinsep's opinion that the Canal cannot interfere at all with the Drainage any more than did the Old Mahratta Ditch, and by the means of the Locks at the entrance, and the natural efflux of the Canal to the Salt Water Lake, it may be prevented from having any pernicious effects on the drainage of the City. In my memory I have known the Mahratta Ditch influenced by as high a tide as I have ever seen in the Hooghly, and I never heard of any inconvenience being experienced by it.

T. C. A.

Minute by Col. Sir
T. C. Anbury.

I have written a separate* Minute, to which I beg to refer.
13th July, 1831.

A. G.

Minute by Col. A.
Galloway.
* See No. 96, of this
Appendix.—J. M.

I agree generally with the Chief Engineer, the Chief Magistrate, the Superintending Engineer, and the Civil Engineer, that no danger is to be apprehended to the Drainage of Calcutta from opening the Canal into the River, according to the Plan which has been sanctioned.

Minute by Col. J.
Craigie.

There would seem, I think, to be a disposition to mystify the matter of the Locks or Gates. It may be proper therefore to explain to Government, that according to the Plan of Gates, proposed by Captain Prinsep and sanctioned by Government, they can only be opened during some months of the year, at certain stages of the tide. That although according to this plan a daily intercourse throughout the year will be maintained between the Canal and the River, for a certain portion of time, yet that the Board being anxious to render this great and important work as extensively useful as possible, have called on Colonel Tickell and Mr. Prinsep to consider and report whether the Locks cannot be so constructed as to secure a communication between the Canal and the River at all times of the day and tides, and at all seasons, without much adding to the expense of the work: that if the Board receive a favourable Report from Colonel Tickell and Mr. Prinsep on this point, they will have the honour to submit a Report thereon to Government.

The Chief Engineer and Chief Magistrate will determine whether their Minutes alluded to by Colonel Galloway are to go up to Government.

J. C.

26th July, 1831.

APP. TO APP. H.

Minute by Col.
Sir T. C. Anbury.

I cannot consider the Canal in itself, or separately as at all influenced by the Hooghly or the Salt Water Lake, but as the Locks, or Flood-gates that are to be constructed between it and the River, may regulate it, and managed, as I imagine and suppose that they will be, and of course made to predominate for the special purposes of the navigation of the Canal at all seasons and times of Tide; the Canal under such management I conceive must be always efficient, and always under controul, and in consequence cannot in any injurious way affect the "Drainage" of the City, any more than it has heretofore been affected by the Old Marhatta Ditch.—The Locks are the only means by which the Canal can, I think, be rendered extensively or efficiently serviceable, and of consequence for the purposes of communication and traffic through the Eastern Canals, and I imagine, that, without the Locks, every benefit originally held forth, and intended from the Circular Canal will be annulled, and with them they will be obtained, without risk of impediment to the Drainage of Calcutta, but rather may be made to assist it, by affording the means of lessening the water in the Canal, when the level of the River may be below the mean level of the water in the Canal without any reference to that of the Salt Water Lake by the Locks; the influx or efflux of the River can be always so managed, and regulated, as never to endanger the bed of the Canal by its rapidity, and sufficient velocity can always be commanded to prevent or avert any superfluity of silt being deposited liable to injure the navigation. I have very attentively gone through Colonel Galloway's expanded Minute; but I do not discover any argument therein to weaken the original opinion I have formed on the advantages to be derived from the Canal, nor do I think I shall alter my sentiments unless occurrences, I do not at present contemplate, should take place, to produce a conviction in my mind quite contrary to present circumstances. I shall be glad to be informed by whom,* and since when, Sluices have been constructed at Bowanepore, and on the Marhatta Ditch, at Chitpore, and since the "Drains of Calcutta do *not* fall into Tolly's Nullah," why they have been placed at Bowanepore? I never remember in the course of 47 years ever to have heard that the City of Calcutta was threatened with "inundation." It seems by Colonel Galloway to be given, that the River is to have an uninterrupted flow at all seasons and times of tide into the Canal—no such matter is intended I presume, since the Locks or Flood-gates would regulate the communication between the River and the Canal, and the dissimilar levels of the Hooghly and the Salt Water Lake have nothing to do with the Canal when the Flood-gates or Locks are down. I have little veneration for what the late Lieutenant Schalch has advanced in any part of his Memoir. When the late Ruben Burrow's, Mathematical Teacher to the Engineer Corps, took the levels from Chandpaul Ghaut, (to the best of my recollection) he made the difference 12 feet; and would have opened the Mahratta Ditch from Chitpore to Tolly's Nullah and the Salt Water Lake but required Locks. Col. Watson, sometime Chief Engineer, and the late Sir Mark. Wood, while Chief Engineer, thought the scheme a good one, but it was not countenanced, and the levels became worthless, as well as the attempt at a Cut† through the Choggedah Nullah into the Sundurbunds. If the Locks are properly constructed, was there 100 feet weight of water, provided the Gates supported the pressure, the whole might be let through the Chambers successively, without stirring a brick. If the Canal is "favourable for the Drainage of Calcutta, in its present state," it will be precisely the same and infinitely more so with Locks at Chitpore, since the level of the Canal can be preserved exactly the same as at present, unless it is otherwise required. I had no objection to the model made by Mr. Prinsep of the Flood-gates: but as they would not answer the object I supposed originally intended, that of facilitating the navigation or passage of Boats from the Hooghly into the Canal, and *vice versa*, I am happy that locks are now intended, which is a very grand and judicious improvement, since it will render the Canal navigable at all seasons of the year; and I am moreover glad, that even at the eleventh hour, I find that, what I should have supposed was the view of the great designer of the Nullah or Canal in the first and original scheme,

*See Papers marked No. 13, and No. 13, a. in this Appendix.—J. M.

† See Papers marked No. 55. to No. 58. in Appendix to Appendix (G).—J. M.

namely, to have a perpetual ingress and egress is intended to be carried into effect. With regard to the impurities thrown into the Hooghly from the efflux of the Canal, no matter by what means, I do not imagine the water will be more foul than it is at present from the impurities that flow down the main stream, and are deposited daily and hourly on its Banks by the very people who *drink* its waters. By means of the proposed Locks, the costly undertaking will be brought to a conclusion, and in my opinion, accomplished in a masterly style. They may cost money: but they will be the only means of making the work perfect. The probable additional expense of constructing Locks in lieu of Flood-gates, compared with the relative advantages in such a grand work as this Canal, I conceive cannot be looked on as a matter of such great importance in any way, than thereby rendering the project efficient, and as money well laid out—There does not appear to me to be any necessity for going into a minute or detailed description of the advantages of Locks over simple Flood-gates, since every one at all acquainted with the construction of both; and their various appliances to Inland navigation by Canals, must be amply aware of their different uses, and separate advantages. I imagine it is no fault of the Board's that Government were not put in possession earlier that the Canal could not be an open Canal, without Locks, or some other means of regulating the water in the Canal, with reference to the River; and I moreover conceive, that cleaning out and widening the Mahratta Ditch would have answered all the purposes of this Canal, without a connection of the same with the River, and the noxious slime of the Salt Water Lake *might* have been brought up into the streets of Calcutta at a comparatively little expense to what has been now incurred. I think we should clearly state to Government, that *without the Locks*, or a *Lock and Sluice Gates*, which no doubt Mr. Prinsep's acquirements render him fully competent to design, the present Canal will become little better than an enormous Ditch, and may ultimately dwindle into such nuisance. Until we get the Report from Colonel Tickell and Mr. Prinsep, I have no objection to my Minutes going up to Government, inasmuch as they may make my opinion known (whether of *any value* or *not*), on the subject: but I think we may well spare Government the reading of such a volume.

T. C. A.

On the 9th August 1831, Mr. Prinsep was requested to furnish, with his revised Estimate for Locks, an Estimate of the time that will require to pass a Boat through the Locks in the rains as well as in the dry season, but not having received a reply to this communication, Mr. Prinsep was again requested, 22nd Nov. 1831, to explain the cause of the delay, and the following has been received in reply. See No. 95½ of this Appendix.

It is with regret I state, that I think this Letter of Mr. Prinsep is very unsatisfactory. I observe that in consequence of his Letter of the 5th June to the Superintending Engineer (and the Report of the latter), in which Mr. Prinsep states "that the scheme proposed for the Circular Canal *never contemplated leaving open the communication with the river during the rainy season: indeed that it had been deprecated from the commencement even if no inconvenience were likely to occur to the Drainage; such damage would inevitably ensue to the Banks and bed of the Channel from the velocity and turbidity of the river water as would soon completely destroy the main object of the Canal, permanency of section and depth,*" meaning in plain words, *without completely destroying the Canal*, the "main object" of the Canal is the passage of Boats. It was not the intention of some members of the Board to shut up the communication during the rains: an explanation was called for from Mr. Prinsep as to the Locks proposed, and adverted to in the Superintending Engineer's Letter, now

Minute by Col. A. Galloway.

intended as it appears to be opened in the rains so as to admit the river. This was called for four months ago, and the present Letter is the information obtained, containing in fact no information at all. On the contrary we are informed, that a plan and model of a Lock-gate, prepared by the late Superintendent, for a Canal *not to be opened to the river during the rains*, has received the approbation of the former Committee and sanction of Government, and therefore Mr. Prinsep thought it less imperative to bestow his attention on a Lock-gate that is *designed to open to the river in the rains*, and that all we are to have is a slight modification of the former plan of the Locks. I consider the whole part of the opening as useless and hurtful. But since the orders of Government have been issued, I conceive it my special duty to see that the work to be executed, be fully and substantially adequate to the object. I am therefore disappointed after so great a lapse of time in finding the endeavours of the Board to obtain the information called for as so immediately required, in order that the plan may be carefully and leisurely examined before it be adopted, so fruitless.

A. G.

Minute by Col. J.
Craigie.

Mr. Prinsep's Letter is certainly not very satisfactory, and does not exhibit much desire to attend to the suggested alterations of the Flood-gates. I observe this indisposition with regret, but I must at the same time observe, that the plan of Flood-gates already approved by Government, appears to me adequate to the objects designed to be secured by it. By the present plan of Gate, a communication between the Canal and the Hooghly will remain open during the whole day during certain seasons of the year: in the most unfavourable seasons of the year for communication, the passage will still be effected for several hours in each day, this is, all that the wants of the public will require, and therefore it appears to me that the present plan of Flood-gates will be found preferable to sets of Locks, because they will cost much less, and answer the wants of the community.

I think during Colonel Tickell's absence from Calcutta, Mr. Prinsep might send in his progress reports down to the Board. It is very desirable that the work should be completed during the present dry season.

J. C.

No. 97.

No. 379.

To CAPTAIN GAVIN YOUNG,

Secretary to the Military Board, &c. &c. &c.

SIR,

In obedience to the orders conveyed in your Letter No. 2999, dated the 13th instant, I have the honor to transmit direct for the inspection of the Board, a plan of the modifications which I propose to introduce in my brother's design for the Chitpoor Lock-gates.

2. The principal points in which the present plan differs from the original are as follows:—

3. The foundations are deepened from 4 to 10 feet under the bearing of the Gate Piers, and from 2 to an average of 5 or 6 feet for the floors of the basin and weirs. The actual depth which it may prove expedient to give to the substructure cannot however be prescribed until the nature of the soil below shall be exposed to view. Captain Prinsep, I believe, intended to avoid touching the expected stratum of oozing sand, but should this occur at 25 feet, it will, I think, be better to penetrate it in small portions, and create a spreading mass of grouted masonry upon it, than to leave a thin seam of clay between, which may afterwards

partially subside with the weight of the superstructure. The heavier the mass of foundations the less likelihood is there of their being affected by the walls above.

4. The superstructure is not much increased in scantling, but it is strengthened by counterforts; and by curvature of the profile of the walls.

5. The centre pier is increased from 8 to 24 feet in section: thereby rendering it in fact a double pier (connected by cross-walls), that the masonry of each set of Gates may be in a measure independent in itself, and in case of any settling of a partial nature, the effect may be confined to the spot; each set of Gates, sill, arched floor and piers being connected together by iron rods passing horizontally through the masonry, (as seen in the transverse section) so as to form but one piece, and to be subject to displacement only as such.

6. A second pair of small Gates is introduced within the Lock Chamber, upon the suggestion of Mr. McFarlan, to allow of the passage of Boats when the water of the Canal is higher than that of the River. There will however be a limit to their application, since, when the River is at its lowest level, the water in the Lock Chambers will hardly be sufficient to float any but the smallest description of Boats, and indeed at times the floor will be nearly dry.

7. Instead of two Drawbridges side by side, as originally designed with two fixed bridges over the adjoining Lock, I propose to substitute a single roadway with Drawbridges in succession over both of the Locks: increasing the width of roadway from 10 to 16 feet; this will render both of the Lock passages equally useful, and experience has shewn that a bridge of a single roadway is more convenient than a double one of twice the breadth.

8. I have also changed the position of the Drawbridge from the centre of the Lock Chamber to the inner pair of Gates; because in the latter situation it will be only necessary to raise the bridge during the moment of a Boat's passing in or out of the Chamber, whereas in the former position, it must have remained up during the time of entering and that of filling or emptying the water of the Chamber through the culvert or sluice.

9. It may however be a question since Suspension Bridges have been adopted everywhere else on the Canal, whether they should not be applied here also: and undoubtedly by making the bridge span over the innermost gates, and by giving a little additional height to the platform, the passage would remain free to all Boats which could pass under the other bridges, while the thoroughfare along the Chitpoor Road would remain unimpeded. The increase to the estimate would not be material.

10. One point I have not altered, although I am inclined to recommend it to the adoption of the Board. In the original plan, the Canal is everywhere excavated to the depth of 9 feet below the zero, or average level of the Lake, but the sill of the Gates is set only 7 feet below the same level. The neap-ebbs of the Hoogly in March and April sink to 5, 6, and occasionally even to 7 feet, leaving the floor of the lock nearly dry. Perhaps it may be preferable to give the same depth of 9 feet to the latter at once; and to make the outer Gate 24 feet high instead of 22. The inner pair of Gates need not be altered in height as it is but very seldom that the maximum height is attained, and then only for a short interval of the Flood-tide.

11. In the Board's instructions of the 9th August, I am desired to state what time will be occupied in filling or emptying the Chamber with water.

This of course depends upon the head of water outside and upon the section of the culvert or sluice. Assuming 8 feet for the average difference of level and 2×3 feet for the area of the passage, I calculate that about two minutes and a half will be required, independently of the manœuvring of the Gates.

12. In making the annexed estimate to accord with the alterations of the plan, I have been guided by the scale of charges in the original; the chief additions occur in the items of masonry, and Gates. The former is increased from 92,000 to 223,578 cubic feet. In

the latter the number of Gates is doubled, since the original seems only to provide for single Gates. In such a work the greatest latitude must be allowed for contingencies, especially where the nature of the ground is so little known, and there are no parallel works with which to compare the estimate, many items are, I think, rated higher than need have been, but I have purposely let them stand, and I should beg to recommend that the Board, should they think it necessary to apply to Government for the approval of the revised plan, should in general terms be prepared to incur an outlay not exceeding a Lakh of Rupees upon the Chitpoor Lock-Gates.

I have the honor to be,

Sir,

Your most obedient Servant,

JAMES PRINSEP,

Superintendent of Canals.

CALCUTTA :
17th December, 1831.

No. 97. a.

No. 12.

Estimate of the probable Expences of constructing a pair of double Lock passages for the Circular Canal at Chitpoor, according to the revised Plan and elevation furnished by Mr. JAMES PRINSEP, 17th December, 1831.

To Excavating in quantity 600 Chowkas @ 2/8 per Chowka,	.. ..	1,500	0	0
To Raising water, puddling against the oozing sand stratum, and keeping the work constantly dry, Estimated at most	.. .. .	5,000	0	0

MASONRY.

Cubic feet.

Foundation sides,	105 × 13½ × 10 × 2	28,350
Wings of ditto,	40 × 9 × 10 × 4	14,400
Ditto Central,	140 × 27 × 8 × 1	30,240
Floor, Arched,	105 × 21 × 6 × 2	26,460
Slopes A. B.	50 × 20 × 4 × 4	16,000
Walls-sides,	36 × 10 × 22 × 2	15,840
Ditto ditto,	42 × 6 × 22 × 2	11,088
Counter-forts,	4 × 7 × 22 × 10	6,160
Wings,	40 × 6 × 22 × 4	21,120
Do. Central-pier,	125 × 6 × 22 × 2	33,000
Counter-forts,	50 × 10 × 22 × 1	11,000
Bridge Piers,	18 × 6½ × 10 × 4	4,680
Wings,	24 × 4 × 10 × 4	3,840
Parapets,	24 × 2 × 5 × 4	960

223,138 @ 20 per o/o c. ft. 44,627 9 7

Stone of sills, grooves and coping [2500 worth in hand] say as much more required,	.. .. .	5,000	0	0
Two Drawbridges, containing 1200 running feet of timber with Iron-work complete, say, 3-5-4 per running foot,	.. .. .	4,000	0	0

Carried over, ... 60,127 9 7

Brought forward, ...	60,127	9	7
Four outer pairs of Gates, 22 feet high 15 wide, each flap with timber grooves, aprons, brass crapandines, &c. coppered, @ 4-8-8 or 8/11 per square foot, ...	12,000	0	0
Two inner pair of Gates, 14 feet high 15 feet wide, ditto ditto complete, @ 11-14-5 or 5/7 per square foot, ...	10,000	0	0
Roadway of approach, &c.	2,000	0	0
Four Sluices with draw hatches for the culverts in the centre pier, ..	800	0	0
Eight Windlasses with chains, &c.	1,600	0	0
Ditto Lighter for inner Gates, ...	1,200	0	0
80 Saul timbers to fit grooves, @ 50 Rupees each, ...	4,000	0	0
Contingencies unlooked for, baling water, piling, staking, and Establishment, say, ...	6,784	6	5
Four Iron Lamp-posts complete, @ 100 Rupees each, ...	400	0	0

Total Sicca Rupees, 98,912 0 0

The cost of the last item of four Iron lamp-posts was missed in addition by Mr. Prinsep, which causes the large difference.

CALCUTTA, SUPDT. CANAL'S OFFICE :
28th December, 1831.

JAMES PRINSEP,
Superintendent of Canals.

No. 97 $\frac{1}{2}$.

Minutes by the Members of the Military Board with reference to the Papers marked Nos. 97. and 97. a. in this Appendix.

The deepening or increasing the thickness of the foundations and the adoption of counterforts, I think absolutely requisite to a proper precaution, and in addition, if Mr. Prinsep has any doubts of his ground on which the foundation, and indeed all the masonry is to rest, I would recommend his satisfying such doubts by the use of the borer—the expectation of a “stratum of qozing sand” is a matter not to be treated lightly, and of course he will take his measures, and proceed accordingly. I would, if possible, be clear of any sand on which, or mixed with which, grouted masonry would afford me no confidence; grouted masonry is good under a foundation, but where a treacherous sand presents itself, I fear it would not altogether insure safety, no doubt can be entertained that the perpendicularity of the walls, and their efficiency depends greatly on the solidity and perfect level of the foundation.

I imagine that the walls are ample in substance, and of course counterforts will add to their strength and support, besides the curvature of the profile, which is a judicious plan, as well as the method proposed of constructing the Floors or sole of the whole.

I am not aware of the necessity of varying the heights of the Gates within the Lock Chamber, or that it will be any facility to the passage of Boats when the water of the Canal is higher than that of the River: the Chamber must be filled for the passage of Boats to the height either of the Canal or the River, and by the opening of the opposite Gates the Boats are discharged either way, unless the River should be lower than the sole of the Chamber, when it must be allowed to rise above the sole of the Chamber, to Floating depth for the Boats—at least this is my theory of the management of the proposed Locks.

Minute by Col.
Sir T. C. Anbury.

The arrangement of the passage over the Locks, is, I think, very good and convenient ; it may be matter of hereafter consideration, whether to recommend a Suspension Bridge or not. Under Mr. Prinsep's statement I should say that it would be desirable, although more expensive, in the first cost—the outlay would be saved in its durability.

I should recommend the sole of the Locks being laid at nine feet below the zero instead of seven, and for the reasons given by Mr. Prinsep, and I would make the Gates accordingly, and all the Gates the same. I do not exactly comprehend the advantage of the inner Gates being of less height than the outer Gates.

I imagine Mr. Prinsep has approximated as near the truth as possible in framing his Estimate ; but contingencies, many and various, must no doubt occur in such a work from impediments, from water collecting and consequent clearing of the same, possibly night-work, which must be paid for extra, and more contingencies than I can enumerate, and hope will not happen ; the ground will I trust be well examined ere the foundation is laid, and if that is done, I think there will occur few other difficulties or obstructions. I think tenders may be invited for the Gates, &c., or direct application for Estimates for them from the parties mentioned by Mr. Prinsep : for certainly the individuals mentioned are better acquainted with the practical construction of such work than any one else here, and will probably do them cheaper, and with better work.

T. C. A.

Minute by Col. J. Craigie.

The Letter from the Superintendent of the Canal, with the Plan and Estimate, should immediately be transmitted to the Superintending Engineer, L. P. for report. Colonel Tickell should be instructed to consider the subject involved in these Documents in all its bearings, and to submit a Report on the best mode of effecting a communication between the Canal and River, combining utility with economy. With reference to the opinion expressed by Capt. Forbes, of Engineers, in his answer to the questions of the Canal Committee, dated 24th October, 1828, " that without Dams, Tide-Gates, or Locks, the current entering or retiring from the Canal may, by various means, be made so to modify and regulate itself, as to admit of safe and convenient navigation at all times of the Tide, and at all seasons of the year," the Superintending Engineer should be directed to communicate with that officer, and to report whether any of the means alluded to by him, may not be preferable to any of the plans hitherto proposed for effecting the object.

(Sd.) J. C.

Minute by D. McFarlan, Esq.

I am disappointed with this Letter of Mr. Prinsep's, his present views are confined to certain emendations of Captain Prinsep's plan, which was apparently rather a feeler after the best, than one complete and compact in itself ; had he lived he would doubtless have suggested alterations and amendments, and discussed them so fully as to have enabled the Board confidently to recommend them. There are many views in which the question presents itself which need not to be fully discussed at this Board, and under the circumstances perhaps the only plan is, to send the papers to Colonel Tickell, through whom they would properly come before us. I question much, if any good is likely to come, of putting him into communication with Captain Forbes ; indeed the absence of that officer from the Presidency may lead to delay, and the direction should therefore be made contingent, and to be acted upon only if circumstances permit. It should not be forgotten, that Captain Prinsep's plan, such as it is, is already sanctioned, and that under the Chief Engineer's approbation, we shall not be wanting in our duty if we merely recommend the alterations. Mr. Prinsep I believe is about to make a rough model, which will facilitate a due understanding of the subject.

D. McF.

No. 98.

No. 3503.

FROM THE SECRETARY TO THE MILITARY BOARD,
TO THE SUPERINTENDING ENGINEER, L. P.

SIR,

I am directed by the Military Board, to transmit to you for Report the accom-

panying Letter from Mr. Prinsep, dated 17th ultimo, with the papers connected with it noted in the margin,* together with two Plans of the Tide-Gates.

Replies to the Queries addressed by Captains Forbes, Colvin, and Fitzgerald, Mr. J. Kyd, and note of Major Taylor.

Letter of Major Jackson to Secretary Prinsep, of 19th November, 1827.

Memoir of the late Capt. Prinsep.
Letter from Secretary Prinsep, dated 6th December, 1827.

Letter from James Prinsep, Esq. dated 26th November, 1831.

Letter from Do. Do. 17th December, with the Estimate and a plan by the late Capt. Prinsep, Ditto one by Mr. Prinsep.

The Board request you will submit a Report on the best mode of effecting a communication between the Canal and River, combining utility with economy. With reference to the opinion expressed by Captain Forbes, of Engineers, in his answer to the questions of the Canal Committee, dated 24th October 1828, "that without Dams, Tide-Gates, or Locks, the current "entering or retiring from the Canal may, by various means, be made so to modify and regulate "itself, as to admit of safe and convenient Navigation, at all times of the Tide, and at all "seasons of the year." You are requested to communicate with that Officer and report whether any of the means alluded to by him may not be preferable to any of the Plans hitherto proposed for effecting the object.

I have, &c.

(Sd.) G. Y.

17th January, 1832.

P. S.—The Original paper to be returned with your reply.

* See Appendix
H. Nos. 89 a, 95 a,
and Nos. 107 to
111.

No. 99.

No. 2460.

FROM LIEUTENANT COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

TO CAPTAIN G. YOUNG,
Secretary Military Board.

Canals.

Barrackpore: 29th February, 1832.

SIR,

I have the honor to acknowledge the receipt, on the 21st, of your Letter No. 3503, of the 17th ultimo, and several enclosures, relative to the proposed Tide-Gates at the entrance of the Canal near Chitpore; and having personally communicated with Captain Forbes and Mr. James Prinsep on the subject, beg to enclose copy of a Correspondence, as

* From Superintending Engineer to Mr. Prinsep, No. 2199, of the 2nd February 1832.

From Mr. Prinsep to the Superintending Engineer, No. 393, of the 11th February 1832.

From Ditto to Ditto, No. 396, of the 22nd Ditto.

noted in the margin,* with the latter Gentleman, with whom I entirely agree as to the necessity of constructing a Lock at Chitpore, as originally intended by his predecessor, the late Captain Prinsep, all the works connected with the Circular Canal having been constructed with a view to such

a measure, in order to maintain the level of the Canal at a height not exceeding 9 feet above zero.

2nd. I would therefore recommend the adoption of the plan suggested by Mr. Prinsep in the 15th paragraph of his Letter No. 393, that of substituting a single Lock of 30 or 32 feet in breadth for the two Locks of 24 feet each, not only as being the least expensive, but as throwing open a direct communication with the Sunderbunds to the River Steamers, and for the several other reasons stated by Mr. Prinsep, all of which I think are good arguments in favour of the measure. The want of a second entrance may possibly be felt hereafter, but in that case, another of smaller dimensions, calculated for River Craft, may easily be built at any time adjoining that now proposed, the site of which may be so selected so as to admit of such addition without inconvenience or difficulty.

3rd. Various modes, no doubt, might be proposed for shutting out the River at Chitpore, without the intervention of a Lock, but they would all, most probably, be found nearly as expensive, and their efficacy, from being untried, very uncertain. The Floating-Gate suggested by Captain Forbes is one of these, but even had it been brought to perfection, it could not have been adopted on the present occasion, with reference to the height of the new Suspension Bridges; being intended, not so much to regulate the level of the Canal inside, as to check the velocity of the current at the entrance Chamber.

4th. I herewith beg to return the two plans, and several documents received with your Letter under reply.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, *Lt. Col.*,

Superintending Engineer, Lower Provinces.

No. 99. a.

No. 2199.

FROM LIEUTENANT COLONEL R. TICKELL.

Superintending Engineer, Lower Provinces

TO JAMES PRINSEP, ESQ.,

Superintendent of Canals.

SIR,

Barrackpore: 2nd February, 1832.

Having been called on by the Military Board to submit a report on the best mode of effecting a communication between the Canal and River, combining utility with economy, I have to request that you will favor me with your opinion on the following points:

1st. Whether or not you consider a Lock and Gates, such as you have lately proposed in your revised Plans and Estimate No. 12, of the 17th of December last, indispensably necessary for maintaining the Navigation of the Canal; or whether or not you are of opinion that inconvenient or dangerous consequences would result, were a secure entrance Channel, equal in area to the intended Lock Chamber, left open to the Hoogly?

2nd. Should you have any doubts on the latter subject, whether you do not think that, during the ensuing rainy season, you could conduct such a set of experiments as would afford tolerably sufficient data for estimating the effects that such an influx of water would produce on the banks of the Canal, on the Canal itself generally, on the level of the Salt Water Lake, and on the property adjacent to it, and to the line of Canal?

lxxix

3rd. Whether or not you believe that the navigation between the Canal and River could be maintained by means of Log Dams or other contrivances, without the intervention of Locks?

4th. Whether you consider the Lock proposed could have its foundation laid in the sandy soil at Chitpore, at the depth planned of forty-four feet below the surface, without the aid of a powerful steam engine?

I have, &c.,

(Signed) R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 99. b.

No. 393.

FROM JAMES PRINSEP, ESQ.,
Superintendent of Canals.

TO LIEUTENANT COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces.

SIR,

Calcutta : 11th February, 1832.

I have the honor to acknowledge the receipt of your Letter No. 2199, dated the 2nd instant, calling for further information on the subject of the Circular Canal; to which I beg leave to reply in the order of the questions referred to me.

2nd. The object of introducing Locks in the scheme of the Circular Canal was three-

fold: namely, 1st, To secure the drainage of the Town from injury by the raising of the Salt Water Lake and Canal levels;—2nd, To prevent the destruction of the Banks and Bridges by the current of water in the rains, which Major Schalch estimated at three and a half miles per hour; and Lastly, To protect the Canal from the effect of the silting expected to ensue on the admission of the turbid River water, which Major Schalch (upon Major Rennell's authority) assumed to contain *one-fourth of its weight* of sand.

3rd. The last objection is of no value, since the statement upon which it is founded is altogether erroneous, and a greater danger is now proved to await the Canal from the silt deposited by the City Drains, which a current of River water would, in some respects, diminish.

4th. The second objection is not of much avail either, since it does not appear that the Banks of Tolly's Nala are cut away, nor its Bridges undermined, although the current from the River is as strong as it need be in the new Canal; for, by contracting the entrance sufficiently, the current in the latter may be placed precisely on the same footing as in the Tolly's Nala.

5th. The first objection is of more serious consequence, as it is obvious that, wherever the water may be raised to more than ten feet above the zero, it will be even with the Circular Road, and will entirely prevent the Drainage of a considerable portion of the Town, *while it continues at that elevation.* In the Appendix to Major Schalch's Memoir it is shewn, that at high-water spring Tides, when the Tide entered freely into the Marhatta Ditch, and flowed through it to the Salt Water Lake, the surface of the stream at the Sam Bazar Bridge was only six feet ten inches above the Lake level, while it was nine feet six inches in the River, and only three feet at the Bridge on the Dum-Dum Road; the opening of so small a Channel, therefore, as the Marhatta Ditch, could only injure the Drainage of the immediate neighbourhood of Chitpore, which could be obviated by carrying the Drains onwards separately from the

Ditch, and making them fall into the same Ditch beyond the Dum-Dum Road, at a part where the level was but little influenced.

6th. The same thing may still be done; last year, in fact, it was done; for the Dum-Dum Road Drains having been blocked up by the earth of excavation, the only exit for the drainage of the Marhatta Ditch was by the Ooltadunga Tunnel Drain; at this point, it will be seen by my Letter* to your address of the 5th June last, the water of the Canal, if open to the River, would have an elevation of about six feet above zero, leaving three or four feet for the slope of water in the Drains; this calculation depends upon the admission of River water by a Channel *equal in area to the Chamber of one Lock*, or twenty-four feet wide; and some modification is necessary to adapt it to the contingency of leaving the whole section of the Canal freely open to the River. To suit the latter case, it may be assumed, that the level of the River in the freshes is eight feet higher than the Lake level, and that the section of the Tarda Nala at its exit from the Lake is of the same dimensions nearly, as the Canal of supply; then, the rise of the Lake level may evidently reach one-half that of the Hoogly: namely, four feet above zero, and if the distance between the Lake and the River be supposed a continuous slope, then the elevation of the surface of the Canal at the mouth of the Ooltadunga Drain would be *seven feet above zero*; not differing more than a foot from the former Estimate: at the height of the spring Floods, undoubtedly the water would rise four or five feet higher, but this would form only a temporary inconvenience to adduce an instance of similar circumstances.

7th. The southern part of Chowringhee and the Suburbs of Bhowanipore, &c., are Drained into Tolly's Nala at a spot two miles distant from its mouth in the Hoogly, where, if I understand the Tables of Tides, Registered by my brother, aright, the surface of the water in the Flood-tides of September stands *twelve feet above zero*, or higher than the general level of the Circular Road. The *mean* height, or *mean of low and high water* at the same season is, however, only *seven feet above zero*, leaving a fall of two or three feet from the Circular Road; and this is, no doubt sufficient to draw off all of the rain water, although there may be a partial reflux through the Drains, during part of the Flood-tide. The position of the Manicktola Drain resembles precisely that just described, and the Drainage of all places southward of this point would be as feasible as that of Bhowanipore. Having no personal experience of the actual state of the Drainage in that neighbourhood, I cannot speak of the inconvenience which the tardy flow of the water may cause, and, before finally drawing conclusions, it would be advisable to examine fully into this point.

8th. I am disposed, therefore, on the whole, not to consider the Drainage of the Town an insurmountable objection to the throwing open the Canal to the River; such a measure would undoubtedly prevent the free discharge, which now takes place from the Drains (greatly to the detriment of the Canal), but the Town would still be cleared of water with sufficient rapidity to prevent any actual inundation.

9th. There are other inconveniences, however, attendant upon the proposed measure of opening the Channel, besides that of injury to the Drainage; one of these is the height of the Bridges of Suspension, these have been constructed on the idea of the level of the Canal remaining at *nine feet above zero*, and they would not allow of the passage of large Boats were the level much raised. The Bridges over Tolly's Nala are more elevated than those of the new Canal.

10th. The experiment suggested might certainly be made, although I think that the result of the measure may be calculated sufficiently well without. Moreover, as it would not be prudent to open more than a small section (equal in area, say, to one Lock Chamber) the velocity of the stream at the mouth would act considerably upon the Banks at this place, and would wash a great quantity of deposit into the Chitpoor basin.

† See No. 95a. of this Appendix, p. lviii.

Copy forwarded with my Letter† No. 444, of the 14th of June last.

R. T.

11th. There would be no danger to the Canal Bridges, as the Barrackpore and Dum-Dum Bridges were purposely laid much deeper than originally designed, and the others are situated too far off to feel any evil consequences.

12th. The object of the Log Dam proposed by Major Schaleh as a substitute for Lock-Gates, was to shut off all communication between the River and Canal during the rains, and certainly with such a contrivance, all navigation must be suspended pending its application.

3rdly Whether the navigation between the Canal and River could be maintained by Log Dams, or other contrivances, without the intervention of Locks

13th. The substitution of a Floating Gate to check the velocity of the current proposed by Captain Forbes would not, in my opinion, be productive of any benefit. The Boats necessary to lift the float must necessarily take up a greater part of the opening and impede the navigation: the expence of the masonry and apparatus would fully equal that of the Lock itself, while its efficacy is, in my opinion, very doubtful. I have not estimated the resistance that would oppose the lifting of the Gate, but it is capable of strict calculation.

4th Whether the foundation of the Lock could be laid without the aid of a Steam Engine

14th. On this point, I can now speak with certainty, as the excavations for the Lock have been carried down to the level of the sill of the gates, and the earth proves to be a good consistent clay, so that there will neither be occasion to carry the foundations to any thing like the depth mentioned in your letter, 44 feet;*† nor to adopt any measures for removal of the water, indeed, if I am permitted to commence upon them at once, the whole of the difficult part of the undertaking may be executed during the present dry season; and even if it be determined to relinquish the Lock altogether, and only to construct a secure

*The depth in my plan was $22 + 10 = 32$ feet

†I measured to the Roadway at the Bridge, which it appears rises 10 feet there]

R. T

entrance Channel of masonry (which must be so much the stronger, that it will have to cope with the constant corroding action of a rapid stream), still not a moment should be lost in laying down the foundations at the present season, and as the stones for the sills of the Gates are all ready cut, it will cause no additional expence to make preparations as though the Gates were to be erected.

15th. If it is the great expence of completing the Locks, which has led to a discussion in the Board as to the possibility of doing without them altogether, I beg leave to submit that one measure suggests itself as certain to reduce the expenditure perhaps as much as one-half, while it will allow of a trial of the free passage system without producing any injurious elevation of the Salt Water Lake: it may also be the means of opening the upper Sunderbund passage to the River Steamers. The plan I allude to, is to substitute a single Lock of thirty or thirty-two feet in breadth for the two Locks of twenty-four feet. It is possible to make the stones prepared for the latter suit the former, and the plan and design furnished for the one may equally serve for the other on a scale somewhat enlarged. Should the free passage be found convenient, the gates may be opened or removed altogether, the small back gates at any rate will be found serviceable in preserving a depth of water in the Canal during the dry season.

16th. On this important point, however, I must beg for immediate instructions, as I have hitherto proceeded on the plan already sanctioned by Government; and I am now prepared to excavate the foundations at Chitpore accordingly.

I have, &c.
(Signed) JAMES PRINSEP,
Superintendent of Canals.

No. 99 $b\frac{1}{2}$.

No 396

FROM JAMES PRINSEP, ESQ.

Superintendent of Canals

TO LIEUTENANT COLONEL R. TICKELL,

Superintending Engineer Lower Provinces

SIR,

Canal Office: 22nd February, 1832

* See No 13a
page xvii of this
Appendix.—J M.

In continuation of my Letter of the 11th instant (No 393), I beg leave to state, that I have examined the Drain* which runs from the south-east corner of the Chowringhee Road to Tolly's Nala. It is a very considerable Drain, about equal in magnitude to the old Marhatta Ditch; it empties itself into the Nala at $1\frac{1}{2}$ mile from its mouth in the Hooghly, and the Tide from the latter, in the rains, rises almost even with the level of the Road or Banks of the Nala. There is a double Sluice Gate to prevent the water of the Nala at these seasons from entering the Drain, but it is of little use, because the Drainage water in the meantime accumulates so fast as to raise the level of the water *behind* the Gate, even with that in front of it. At high water, I am informed, the Drain at the corner of the Chowringhee Road is also filled nearly to the surface, but the inhabitants of that part of the Town do not remember any inundation ever taking place.

2nd. If I understand that you have requested my opinion as to the necessity of completing the Locks of the Circular Canal, according to the original intention of the designer, I beg leave to subjoin to my former observations, that, although the existence of the Locks is not indispensable to the Drainage or to the maintenance of a Canal communication, still, with respect to the actual state of things, the construction of the Bridges, Banks, Roads, &c., I consider it necessary to preserve the level of the Canal below the coping of the revetment walls of the Bridges; otherwise very few Boats will be able to pass under them: and the completion of the Lock alone puts it in our power to command this essential point. I think, therefore, there should be no hesitation nor delay in carrying it into execution at once.

I have, &c ,

(Sd) JAMES PRINSEP,
Superintendent of Canals

True Copies

R. TICKELL,
Superintending Engineer Lower Provinces

No. 99 $\frac{1}{2}$.

*Minutes by the Members of the Military Board with reference to the
Papers marked Nos. 98. 99. 99 a. 99 b. and 99 $b\frac{1}{2}$. in this Appendix.*

Minute by Col. Sir
T. C. Anbury.

I am decidedly of opinion, that the Canal will be of little worth without the Locks, by which to afford a ready communication with the Hooghly, and I agree nearly in all Lieut.-Colonel Tickell has shewn on the subject, save that of *now* constructing a single, while the contingency of a second Lock, though of smaller dimension, may be hereafter required, merely on account of the present expence: the measure of constructing another Lock, (if I understand Colonel Tickell aright), abreast of the single Lock, I think, in the attempt, may prove danger-

ous, inasmuch as in excavating for another Lock in such a position, might tend to weaken the work of the first erected one throughout, and I think might be particularly injurious to the foundation: but if it is contemplated to make a second at a moderate and convenient distance from the first, I think the plan judicious, and affording many advantages, it may not be here necessary to enter upon at length. I am decidedly of opinion after very attentively perusing Mr. Prinsep's Letter, that the Lock, either double or single, is essential, and that every advantage to the complete navigation of the Canal may be expected as the result of the plan being carried into effect, the free communication of a current from the Hoogly and vice versâ through the Canal from the Lake one way, or even both, may dissipate the silt, or filth from the drains, and whatever other matter may be collected in the Channel of the Canal. By the Locks I conceive that the water can be retained at any required height above zero. Of Captain Forbes' plans for a floating sluice I cannot say any thing: because I have not seen the plan; or the scheme of it explained. I think there is not any time to be lost in having the work accomplished, and I have only to suggest, which I hope has been already anticipated, that the soil on which the work is to rest, be thoroughly probed, and its tenacity ascertained, on all else I think Lieutenant Colonel Tickell has afforded all the information required.

T. C. A.

Since receiving the newly circulated papers, I have conferred with Mr. Prinsep himself on the subject; he concurs with myself in thinking after all, that the idea of admitting steamers into the Circular Canal must be abandoned, first their funnels must be very low indeed to admit of their passing under the Bridges, 2nd the Canal must be cleared of every other description of Boat, a tyrannous sort of procedure not easily carried into effect, and 3rd, the Entally Canal would not have water enough. The idea of steamers being therefore abandoned, the enquiry necessarily comes, why have so wide a Chamber as proposed in the 15th paragraph of Mr. Prinsep's Letter: the objections to very large Chambers are the expensiveness of masonry, and especially of the Gates, the cumbrousness, and difficulty of working very large Gates, and the extra time that must be consumed in filling and emptying them. Upon these considerations I found Mr. Prinsep willing and anxious to have small Locks of 24 feet.

Minute by D.
McFarlan, Esq.

The Locks which he has proposed in his revised Estimate are double, that is, two abreast with each, one Chamber and four Gates, differing only from those already sanctioned by having one small Gate, the advantage of which is great, and the expence very trifling, the great increase in the Estimate arises from strengthening the works originally proposed.

My view is, and Mr. Prinsep concurs, that at present we should recommend only one Lock, not a double one. My reasons are, that the more I consider the matter the less satisfied am I, that Locks are required at all—in deference however, to general fears, and with reference also to a certain quantum of positive benefit which will accrue from a Lock, in the height of the freshes and perhaps at other times also, I think we should have one Lock, the expence of which will be only one-half of the two Estimated for. Mr. Prinsep assures me, that means can be taken to allow of a second being added, should future experience show it to be at all desirable.

I have inspected Mr. Prinsep's model, which is made of stone, brick and wood, and represents in every item what the work will actually be. I have seen Captain Forbes' scheme adverted to by Colonel Craigie, than which nothing can be more unlikely to answer any good end, and which must be greatly more expensive than Lock-Gates.

D. McF.

The impression on my mind is, that the Gates in the end will be dispensed with altogether. Already we have Mr. Prinsep's reporting that two of the reasons which indicated the

Minute by Col. J.
Craigie.

* See Appendix J
Nos. I and II.—
J. M.

expediency of their construction, are no longer influential, and the obvious leaning of his mind is, that the third reason may also be disregarded. We certainly in the instances of Tolly's Nullah and the Marhatta Ditch, have experienced,* that no serious evils have been sustained from the free ingress and egress of the waters of the Hooghly into these Channels. Under these circumstances I think the expence to be incurred in the construction of Gates should be as limited as possible, and that in the first instance only one set should be erected. The circumstances which oppose the admission of Steamers into the Canal, as stated by the Chief Magistrate, appear to me conclusive on that point. I therefore think it would be inexpedient to increase the width of the opening to thirty or thirty-two feet, as proposed under an expectation that the Canal might be made available for Steamers. By restricting the work in the first instance to one Lock of twenty-four feet, we shall greatly reduce the expence of the undertaking, and secure at the same time such extent of advantages as prudence seems to dictate, with reference to the Drainage of Calcutta. Another Lock can of course be constructed abreast of the first one hereafter, should experience show it to be necessary. I have never for a moment thought that an opening into the Hooghly, either with or without Locks, should be dispensed with.

As the stones and materials for the construction of one Lock would seem to be in readiness, Mr. Prinsep should be instructed to proceed with its construction, with the utmost energy: the season is far advanced, and he has requested immediate instructions. The description of the ground for the site is very satisfactory.

J. C.

No. 100.

No. 2991.

FROM THE SECRETARY TO THE MILITARY BOARD,

TO COLONEL T. WOOD, C. B.,
MAJOR IRVINE,
CAPTAIN FORBES.

GENTLEMEN,

I am directed by the Military Board to acquaint you, that you are appointed a Committee for the purpose of examining and reporting on the state of the Circular Canal, its Bridges, Roads, and Drains, and the works connected with it, their present condition, and in the event of a current from the River being admitted generally, you will be pleased to Report your opinion on whatever may appear to you deserving of notice as to the state of the Canal.

Captain Baker and Mr. James Prinsep, who will attend your Committee, will be directed to furnish you with whatever plans and information you may require.

I have, &c.,

(Sd.) _____

No. 101.

To CAPTAIN YOUNG,

Secretary to the Military Board.

SIR,

Having, as directed by your letter of date the 13th ultimo, examined the Circular Canal, its Bridges, Drains, &c., we have the honor to Report—

1st. That with the exception of the Boitacanna Bridge, not at present dangerously insecure, we consider the Bridges crossing the Canal, notwithstanding several cracks observable in the masonry, as sufficiently strong, and otherwise duly calculated to answer the purposes for which they were erected.

2nd. The suspension chains of the Boitacanna Bridge, we would recommend should be removed from the upper partially cracked piers now sustaining them, and that these piers from the level of the roadway upwards should be rebuilt.

3rd. Conveniently compatible with such rebuilding of the piers, would be the adoption of a suggestion of the Superintendent for raising the level of the roadway of this Bridge one foot or so, as to bring it to the same clear height from the water, as the roadways of the other Bridges.

4th. By temporarily supporting the roadway from below, as further proposed by the Superintendent, we have reason to believe these alterations may be effected without material stoppage of the intercourse by the Road from Calcutta to Balliaghaut.

5th. We would recommend that the Superintendent of Suspension Bridges should be authorized to give the ironwork of these Bridges a coat of paint annually.

6th. The Roads projected parallel to the line of Canal being as yet unfinished, save on the City side, from the Intally Canal to the Ooltadungah Drain, we have only to remark, that from the mode of construction adopted in forming them, they cannot be expected to be of a superior description to those usually met with in the vicinity of Calcutta.

7th. Having ascertained from soundings taken in the course of our Survey, that a large quantity of mud and filth, had been brought into the Canal by the drains entering it from Calcutta, we, from these soundings and from numerous similar measurements previously made by the Superintendent, requested him to furnish a statement of the quantity of soil thus annually deposited. From the annexed detail in consequence prepared, it appears, that during the rains of last season alone, the mass cast down by eight Drains, the total number entering from the City amounted to 883,000 cubic feet.

8th. From this fact and from the Estimate furnished by the Superintendent, of the capabilities of the dredging machines (worked by manual labor,) employed on the Canal, it becomes apparent, that to preserve the navigation permanently open, five such machines, at an annual expence of 15,000 Rupees would be required.

9th. Although at variance with the possibility of keeping the navigation permanently open, we conceive that until the profits derived from the Canal may warrant the expence of a more efficient mode of remedying the evil, it will be expedient (after the rains of each season,) to have Bunds thrown across the Canal, and to have the soil raised by "hand," a mode of procedure which the observation of the Superintendent shows would be most economical, and still more easily practicable after the entrance Locks are completed.

10th. The effect of the Lockage water admitted by these Locks, will doubtless be to disperse more uniformly over the bottom of the Canal the soil now accumulated in nearly impassable shoals at the entrances of the Drains.

11th. The effect of the free admission of the water of the Hooghly, would probably be to move these shoals (in less inconvenient forms) into the Balliaghaut Canal, or that portion of the line of Canals joining the Circular Canal, and the branch crossing the Salt Water Lake.

12th. In the original planning of the Circular Canal, we conceive that provision should have been made for carrying the contents of the Drains alluded to, into the Salt Water Lake by a line which turning to the southward, and partly coinciding with that of one of the Drains of the Circular Road should, after having passed clear of the Intally Canal, have turned to the eastward, and have extended (nearly parallel to the Ballaghaut cut) into the Lake.

When the profits of the Canal will warrant the expenditure, such an obviously beneficial alteration would involve, we doubt not it will be adopted

We have the honor to be, Sir,

Your obedient Servants,

T WOOD, *Colonel, Engineers*

A IRVINE, *Major, Engineers*

W. N FORBES, *Captain, Engineers*

No. 101 $\frac{1}{4}$.

Estimate of the quantity of Soil deposited in the Canal during the rains of 1831, by the several City Drains.

	Cubic feet
The two Drains of Boitacanna Road	75,000
The Sealdah Drain,	210,000
The Narkooldanga (or Muchwa Bazar) Drains,	288,000
The Manicktola two Drains,	120,000
The Ultadunga Drain,	195,000
Total,	883,000

The average length of the main Channels may be called 2 miles without counting branches, the breadth of the bed upon an average say 5 feet, then the above amount of deposit would fill them to a mean height of 3 feet 4 inches. But to make a fair estimate it would be proper to enquire from the Conservancy Department how much *muttee* was generally removed per annum from the Drains, and to examine what proportion of deposit used to take place at the mouths of the Drains in the Salt Water Lake. The deposit for 5 years in the Calcutta Canal, chiefly derived from the Dhurmtulla Drain, has been 2,000,000 cubic feet, or 400,000 cubic feet per annum, which proves that the above are by no means overrated.

CANAL OFFICE :
29th December, 1831

(Signed) J. PRINSEP,
Superintendent Canals.

No. 101 $\frac{1}{2}$.

The work of two dredgers is stated in the abstracts for 1829-30, to be 800,000, but in reality I would think it was about half that quantity, and in this case four such dredgers would be required constantly at work to remove the deposit annually, and one extra Boat would be required to take the place of any out of repair. The annual expence of the Dredging Boats employed at present is Rs. 6,000, or 3,000 each. The total expence of dredging would therefore amount to 12 or 15,000 Rupees annually. It would be much cheaper to throw Bunds across and take up the *muttee* by hand, especially since the Locks will enable the greater part of the water to be drained off at low water neap-tides in the dry season into the Hooghly.

(Signed) J. PRINSEP.

No. 101½. a.

Minutes recorded by the Members of the Military Board, with reference to the foregoing Papers, marked Nos. 101 to 101½ inclusive.

[Committee's Report on the Works of the Canal Department.]

I am of opinion, that the work proposed by the Committee, whose Report is now before us, (2nd para.) should be immediately executed, and that the suggestion by the Superintendent, as stated in 3rd para. should be adopted. If the Bridge Roadway can be raised without impeding the communication, or passage over it, *tant mieux*. The ironwork of the Bridges would no doubt be the better for painting, as it would preserve it—the mode of forming the Roads is not mentioned. I am very sorry to observe that the Committee's Report generally on the state of the Canal is not all that I had hoped it would have been; and more sorry am I to see that the Superintendent's opinions lean towards the probability of its incurring a very heavy annual expence to keep it open; and that resort must be had to separate means of carrying off the drainage of the city. It might have been expected that much of the sludge and silt from that drainage going into the Canal without a current to carry it away, would consequently create partial obstruction. This should have been foreseen, and guarded against, and methods originally adopted to avert such inconveniences which must now be resorted to, incurring heavy expence, and equally considerable inconvenience. The quantity of deposit as stated in the Report, is vastly in excess of what I could have imagined in one season of rain, and if this is not in due time removed, will not only increase the difficulties of the navigation, but also the expence in clearing it hereafter; and if neglected, the shutting up in toto may be expected. I am not quite satisfied that Dredging Machines are efficient remedies, or that they can work with sufficient effect near to the Banks or sides of the Canal; the expenditure thereon, as appears by para. 8 of the Report, is in my opinion enormous, and whether likely to be defrayed by the Tolls on the Canal or not, those who are concerned in the collection of them will be best able to answer. The 9th para. seems to be nearly if not quite a death blow to the concern altogether if the delay in adopting the more efficient means of keeping the Canal open is protracted until the whole is so blocked up, as to require an expence equal to re-excavating, and if the probability of the funds arising from the Tolls being adequate to the required amendment is not speedily ascertained, the Canal may be shut up, and the Tolls, as a certain consequence, also at an end. The expedient of making Bunds across the Canal for the purpose of partially clearing away the shoals occasioned by the deposit from the Drains, seems to me to be very exceptionable—in the first instance the expence will be heavy, and during the operation the navigation must be stopped, and the disposal of the soil not easily provided for, the operation must be repeated periodically, incurring an eternal expence: that it will be "most economical" I am not prepared to believe, notwithstanding the authorities from which the assertion emanates—that the work must be done somehow, there seems to be no question, or all that has been expended is thrown away. I am nevertheless of opinion, that if the Locks are constructed, this Bunding plan may be rendered unnecessary, and para. 10 tends to corroborate my opinions. It was an ill-judged measure in my humble conception to lead the Drainage into the Canal in the first instance, without considering what deposit was likely to be the consequence, and without a knowledge whether Locks would or would not be adopted, and whether any increase of soil at the sole of the Canal could thereby be removed. Whether the Lockage water will have a sufficient fall from the Locks towards the Salt Water Lake, to disperse more uniformly the soil accumulated from the Drains, must be determined by the periods at which the Lockage water is employed,

Minute by Col. Sir
T. C. Anbury.

Minute by Col.
Sir T. O. Anbury.

and the experiment of how long it can be kept in force, and that again depends on the height and periods of the tides in the Hoogly when the gates are opened, and the Locks applied to the purposes required of them, the free admission of the water of the Hoogly at particular seasons, indeed almost at all seasons is quite essential to the existence of the Canal, and to its having an uninterrupted navigation, but if the effect is only to be the removal of the present shoals occasioned by the Drainage of the City, into more convenient forms, much is not I think gained, and we may hereafter have to complain of the shutting up of the Balliaghaut Canal (and the Intally Canal also), and the communication with the Salt Water Lake without continual Dredging. I am disposed to think with the Committee, that the drainage of Calcutta towards the Salt Water Lake ought to have been a subject of prior consideration, and might have been otherwise provided for, or in the way suggested by the Committee, though I am not prepared to say how that would answer in the absence of a line of levels in that direction, although it would be a long and great distance. I do not conceive it impracticable, as far as my observation has gone, to have made a Cut, exclusively for the drainage into Tolly's Nullah where the great falls of the tide are advantageous to great drafts and to drawing up any drainage into it, and against extraordinary spring-tides during the freshes in the Hoogly, a single Flood-gate would be sufficient if at all required, having no levels, I can only judge from appearances. If the revenues of the Canal or the profits arising from resale of the ground, on its Banks should prove sufficient, I should think such funds could not be better or more advantageously appropriated than to the purpose of relieving the Canal from the drainage and sludge of Calcutta, not any notice is taken of the proposed Plan of Locks or the advantages to be derived from them with regard to the navigation of the Canal, although I think the observations in the 10th and 11th paras. is much in their favour. I think the Report should go up to Government ere we propose any thing.

MILITARY BOARD OFFICE :

(Signed) T. C. A.

The 23rd January, 1832.

No. 101 $\frac{1}{2}$. b.

Minute by D.
McFarlan, Esq.

I have not been able to find any data that would lead me either to suspect the accuracy of the Superintendent's computation of the amount of deposit, or to trust to it very implicitly. The matter is not of much consequence, since whether the deposit be great or small, it must ultimately be removed. I may remark, that as far as can be ascertained, there is no material reduction of the amount of deposit in the Drains of the Town, and it would follow that this 883,000 cubic feet of soil, must have been annually disgorged into the Drains leading to the Lake and the Lake itself.

It is computed, that the above quantity of soil would cover about 61 beegahs of ground, to the depth of one foot. The bottom* of the Canal, from the Chit-pore Road to the Salt Water Lake may be estimated at Beegahs 108-15.

* Length 29,000 feet
Breadth 4 feet

Supposing that a current let into the Canal would sweep away half the deposit, we should have a deposit of three inches and one-third annually on the floor or bottom of the Canal.

But before founding any proposition on, or adopting as correct this Estimate of deposit, we ought to have the data on which it is founded stated more specifically. I imagine that there is more than one year's deposit here, and I know also, that there was much earth washed away from the sides of some of the Drains, between the Circular Road and the Canal. The side of the Canal also will have been more worn during the first year, than they will be hereafter, when the earth is consolidated and the banks covered with verdure. It is the more necessary that we should be particular on these points, in order that doubts may not be thrown on the success of an important and public work needlessly.

In regard to the deposit that will be swept into the Lake by a current, I see no reason to apprehend serious inconvenience—were not much of what has been washed into it for 60 or 70 years carried to the Soonderbunds or Sandheads, surely the Lake itself including the present navigation through it, must have been greatly filled up.

Minute by D.
McFarlan, Esq.

The high character of Officers who have sat on this Committee, renders me apprehensive

*A.—Memorandum of the Volume of Water discharged by the Calcutta Drains at their highest water-mark into the Salt Water Lake, between the Chitpore Nullah and the Durrumtollah Drain.

Drains at	ft. in.
Kuntapookur, ...	24 0
„ „ Baug Bazar, ...	6 0
„ „ Shaum Bazar, ...	8 0
„ „ Bulram Ghose's Street, ...	27 0
„ „ Oaltadangh, ...	15 0
„ „ Nundun Baugau, ...	6 0
„ „ Shaumpooker, ...	24 0
„ „ Hoogulkooreah, ...	15 0
„ „ Kistno Baugau, ...	12 0
„ „ Mussulmanparral, ...	8 0
„ „ Maunicktolla, ...	42 0
„ „ Opposite Raimohun Roy's Garden, ...	11 0
„ „ Sukeas' Street, ...	15 0
„ „ North of Hurry Ghose's Street, ...	15 0
„ „ Hurry Ghose's Street at Mutchua Bazar,†	55 0
„ „ Colootollah Tunnel, ...	80 0
„ „ South of Ditto, ...	10 0
„ „ Bottaconnah, ...	32 9
„ „ Durrumtollah, ...	36 0
Total cubic feet, ...	391 9

E. E.

(Sd.) A. H. BLECHYNDEN,

Superintendent.

CALCUTTA :

February 20th, 1832.

† This would require apparently the construction of a Canal 30 feet wide at top, 10 at bottom, and 10 deep, to above 200 feet section.

that the opinions I entertain on their proposition to get rid of this deposit in the Canal, by Draining the northern parts of the Town by a Cut south of the Intaltec Canal, must be erroneous, as however there appears to me to be not the slightest chance of the proposition being ever brought forward as a feasible one, by any practical man. I will not enter upon the Committee's recommendation more fully now. I will only append for future reference, a memorandum marked A,* of the volume of water, for which one great Drain is proposed to be provided, and state (for the same purpose) that the fall available from the Town to the Lake is so small that many of the Drains have actually exceeded their allowance of fall before they reach the Circular Road, and when after the rains the water in them has become low it must be bailed up to

a higher level, in order to take a new start to reach the Lake.

Perhaps we may defer sending up the Report till we shall have received any remarks which Colonel Tickell may offer upon it. When we do send it up, however, we should notice generally that the Committee was convened with the view of placing on record the manner in which a very important public work had been executed, and that although the report has disappointed us, we deem it proper to submit it to Government.

For the reasons above assigned, however, we should before sending up the Report call upon the Superintendent,—1st for an explanation of the data, (measurement or otherwise) on which he has estimated the amount of deposit, noting distinctly the grounds on which the whole or the greater portion of it may be ascribed to the effects of one year's rain.

2nd. We should call for from him and the Superintendent of Suspension Bridges for a joint Report on the causes that may have led to the cracks in the Piers of the Boitakhana Bridge; because if it should turn out that the foundations themselves have inclined to the Canal, there will perhaps be just reason to infer that the same cracks might again occur in the new Piers, and because perhaps the present Piers may stand sufficiently secure if the fulcrum or point of suspension were removed a little back from the present point. They should also Report whether another Bridge, I think the Manicktolla one, is not apprehended to be defective in consequence of the Piers having inclined forwards.

3rd. I think a copy of the Report should be furnished to the Superintendent. There is in it a Statement (paragraph 6) which required explanation. The Roads are constructed on the same principles as the best Roads in Calcutta, and ought to be much better than those in the vicinity, which are of earth—only one-fourth the measure recommended in paragraph 5th, should be authorized.

(Signed) D. McF.

No. 102.

Minute by Lieutenant Colonel Galloway.

[Canals.]

23rd March, 1832.

* Col. T. Wood,
Engineers.
Major Irvine, ditto.
Capt. Forbes, ditto.

† Report dated —
received 23rd Jan-
uary, 1831.

‡ That is the En-
talee Canal.

§ Letter 7th Feb-
ruary, 1832.

ed No. 96, of this
Appendix, page
lxii.

The numerous schemes and conflicting opinions presented to the Board by professional men of high reputation on the further progress of the Circular Canal, render it necessary in my estimation that we proceed with great caution. I have before me an Estimate by Mr. James Prinsep, of the expence of making the Lock passage of that Canal, amounting to Rupees 98,912. Besides which, there is the whole of the valuable ground near Chitpore to be purchased, the cost of which will be perhaps as much more, and I have also before me a Report by a Special Committee of able Engineers,* in which it is reported, that a sum of 15,000 Rupees will be required annually to keep open this Canal, and that moreover, it will after all be impracticable to keep it permanently open, notwithstanding those Lock passages, unless a passage for the water of the Calcutta Drains shall be made in another direction, that is, unless another Canal shall be formed to carry off what will choak up this one.

“Although at variance,” say this Committee,† “with the possibility of keeping the navigation permanently open, we recommend, &c. that the plan suggested by Mr. Prinsep of digging out the soil after the rains, may be had recourse to. The effect of the Lockage water admitted by these Locks, will doubtless be to disperse more uniformly over the bottom of the Canal the soil now accumulated in nearly impassable shoals at the entrances of the Drains.”

This is what the Locks would do. What would be the effect were there no Locks but “a free admission of the water of the Hoogly? The effect of the free admission of the water of the Hoogly would probably be to move these shoals (in less inconvenient forms) into the Balliaghaut Canal, or that portion of the line of Canals joining the Circular Canal,‡ and the branch crossing the Salt Water Lake.”—*Report Colonel Wood's Special Committee.*

Thus has the Canal cut off the line of Drainage of Calcutta: that Drainage must therefore be admitted into it; or, as this Committee propose, a new line of Drainage must be formed. But to admit that Drainage is to destroy the Canal for navigation. Therefore an annual expence of 15,000 Rupees must at all events be immediately incurred, to clear out the soil deposited, and this noisome soil must of course be thrown out in the immediate vicinity of the City where it will lie to the detriment of the salubrity of the place.

Lieutenant Colonel Tickell§ concurs with the Special Committee in the above view. “I lately,” he says, “examined the works on the Circular Canal, accompanied by Mr. Prinsep, and fear that it will be impossible, except at an enormous expence, to keep open the navigation, if the dirty Drains be allowed to empty themselves into it as at present.”

Against these opinions we have those of the Chief Engineer, (in which the other Members of the Board, excepting myself, appear to concur) who says, that “when the Locks are completed every advantage to the complete navigation of the Canal may be expected,” &c. “the free communication of a current from the Hooghly and *vice versa* through the Canal from the Lake one way or even both, may dissipate the silt or filth from the Drains, and whatever other matter may be collected in the Channel of the Canal.”

It might perhaps be sufficient for me to let the question rest on the conflicting opinions borne down, as those on one side are by the immense expence in certain prospect for completing and clearing out this Canal. My own opinion of the impossibility of keeping this Canal free from the deposit of the Calcutta Drains, was expressed in a Minute so long ago as the 13th July last.|| Mr. Prinsep had stated “that the scheme proposed for the Circular Canal, never contemplated leaving open the communication with the River during the rainy

"season: indeed that it had been deprecated from the beginning, even if no inconvenience were likely to accrue to the Drainage—such damage would inevitably ensue to the Banks and bed of the Canal, from the velocity and turbidity of the River water, as would soon completely destroy the main object of the Canal, permanence of Section and depth." I quote from Mr. Prinsep's Letter 5th June 1831, and with reference to this I observed,—“We ought further to consider, since it now appears that only a very diminished strength of current can be admitted from the River, how we are prepared to keep the Canal open from the immense deposit brought into it, not only by the turbid water of the River, but especially by the Calcutta Drains. Further, but supposing we can throw into it a current sufficient to keep it at a navigable depth, whilst it is confined within its own regular Channel and section, how are we prepared to prevent the matter from settling, when this force of current is lost by entering into the extended surface of the Lake? This appears a dilemma. We must have a strong current to prevent the Canal from being choked up, but if we admit a strong current, we destroy the Canal: and thus both with and without a current it must be destroyed.”—I adhere to these sentiments.

The opinion of the Special Committee confirms all this. It would indeed be taking up the time of the Board profitlessly to enter into any argument to prove that a large body of soil brought into a Canal must impede and ultimately stop navigation in it, that no current can be introduced into such Canal sufficient to remove such deposit which will not also occasion a corrosion of its Banks, and “destroy its permanency of section;” and moreover, if such an effect did not take place, it is obvious as demonstration itself, that such a current can only be maintained whilst the water remains confined within the regular section, consequently could a current be introduced and thus kept up so far, the moment that section is extended the current will be diminished, and in this case, as the Canal opens into a wide, shallow, and extended Lake, so the current losing the force, which, when confined, enabled it to bear along the soil suspended in it, must deposit that soil in the shape of a shoal at its entrance into the Lake.

See Mr. Prinsep's Letter above quoted.

I would ask those who propose a Lock of 24 feet width, to admit water into a Canal which I believe is now 90 feet broad; and with a current would soon become much more—I would ask them, what velocity of entrance they would give this water, so as to keep up sufficient force of current throughout, to clear the Canal and to carry off these shoals when the section of 90 feet has expanded to 900 feet in the Lake? and I would remind them, that in working Locks it is but the feeding and emptying sluices, by which water is admitted into the lower branch of a Canal. These, by the plan, have an opening of 3×2 equal to six superficial feet; but if the sluices admitted water at the course of 10 miles an hour, they would not furnish so much as would give *even motion* to the Canal, instead of scouring it of soil and shoals. What then is to be done? To open the Locks entirely? This cannot be done in the rains, the time when those shoals are formed, during that period accumulation must have taken place: it will then remain to be seen what is to move that accumulation.

No doubt a Lock passage firmly founded and substantially built, with the Banks of the Canal raised sufficiently, as Mr. Prinsep suggests, would protect the Town from danger and from inundation, *except by the Drains*, and no doubt also a passage might be formed on a scale small and sinuous enough to be safely opened into the River without any Lock, as the Marhatta Ditch at Chitpore demonstrates. But before we can argue, that because such an opening as that of the Marhatta Ditch at Chitpore exists with safety, contracted throughout and winding by a lengthened devious course, that so also the straight and wide Circular Canal, leading from the River by an easy and short line into the expanded basin of the Salt Lake, 12 feet lower than that River, may also safely exist: we must be prepared to maintain that all forces are equal, all quantities equivalent; and that extent of cause produces no magnitude of effect.

The flimsy nature of the Lock passage proposed by the late Capt. Prinsep, submitted as that which had originally obtained the sanction of Government, weighed much with me. By the plan now submitted, that has been greatly reinforced and strengthened; the Central Pier, which was only 8 feet thick, is now 26, and the foundations are carried down 10 feet instead of two: the whole of the works being also piled in front and in rear. If the Canal is to be opened, no expence, no pains ought to be spared to fortify the works of the Lock. In this part of the discussion I join the Chief Engineer; who justly calls the most serious attention to the examination of the soil under the foundations of the Locks, as well as to the foundations themselves; and no less justly deprecates the notion of a piece-meal passage into this Canal, by first making one opening, and then, if required, another abreast of it, to the certain injury of the former. I am not a little surprised indeed that such a measure should have been seriously proposed. I am no less surprised at the proposition for widening the Chamber of the passage from 24 to 30 or 32 feet, to admit steamers to the benefit of the Canal; but as the Chief Magistrate informs us that that scheme is now abandoned, no further remarks appear necessary.

But I must observe, that so great has been the vacillancy which has prevailed in the plans and schemes propounded for the execution of this work, that I have but little confidence in the projects of those who have shown so little in their own: one thing I wish to see, since Government have resolved that an opening shall be made into the Hoogly; and that is, that the entrance to that opening be formed by work of the most permanent and durable description. I will most cordially promote every thing that tends to strengthen this part of the work.

One Lock of 24 feet now seems to be the favourite scheme, because it is cheap; but this appears to be adopted without any investigation. It is taking, as is supposed, half the original plan at half the original price. But this either reduces the opening of the Canal into the River to half its original utility, or it assumes that the projector of a double passage advised an unnecessary expence. It is at all events a complete change of design, and one that might involve consequences which do not appear to me to be foreseen. In order to show this, if this Canal were of that substantial and permanent nature (and unconnected with danger to the Drainage of Calcutta by obstructing the Drains) that a current might be admitted into it from the River, sufficient to scour it and keep it free from the deposit left by those Drains, without destroying its section, it is obvious that one opening of 24 feet wide might not be able to maintain that current, though two such openings might. Here then the Board will perceive that the reduction of the Lock passage to one of 24 feet instead of two such, is not a simple question. I state this to show the danger of thus adopting mere suggestions without investigating their bearings; but not that I am of opinion the double Lock would answer the purpose intended of keeping this Canal permanently navigable. The whole works, Bridges, &c. on this Canal, have been constructed without the slightest provision for this inevitable contingency from the Drains, but which is itself so obvious, that it ought to have been foreseen and guarded against.

The correspondence and reports should, in my opinion, be immediately laid before Government, in order that they may be made acquainted with the difficulties which now have developed themselves. They should know that heavy expences unlooked for, and of a permanent description, have arisen; that instead of this Canal becoming a source of profitable income, it will become more and more a source of heavy outlay.

Another point I consider of the utmost importance to be brought to the notice of Government, and which throughout the voluminous discussions on this Canal I nowhere perceive to have been thought of, it is this:—We have seen that in the rains the River rises 12 feet above the level of the Salt Lake. But it is known, that for the rest of the year, that is, for about eight months, the level of the River is considerably lower than that of the Lake. The extreme low-water mark of the Hoogly in the dry season is $8\frac{1}{2}$ feet lower than

the surface of the Lake. In neap-tides in February, for instance, the whole rise of the tide is but 8 feet,* so that at that season the current will always set from the Lake into the River.

* See the annexed Table.

The water in the Salt Lake is within a few degrees of being as salt as that at Saugor. That Lake, and the Canal, are the common Cesspools of this immense City : consequently, the quantum of salt water, and impurities of the most offensive description, brought into the River by an ebb of so long duration (at certain seasons constant), must be very great. The poorer inhabitants of Calcutta are obliged to have recourse to the River for their water. That water will then be a brackish mixture, contaminated with the filth of the Calcutta Drains, for, coming into the River on the same side, and just above the Town, the water from the Canal will float down the verge of the Bank for a great distance without even mingling with the stream ; and thus keep its position in shore, where alone water is accessible to the inhabitants, and to the crowded population afloat in Boats along the side of the River.

With reference to this important consideration, as it affects the comfort of the inhabitants of Calcutta, as well as to the Drainage of the Town in the season of the rains, I beg to insert the following Table, showing how, in the rains, the Drains of Calcutta are liable to be obstructed by the Canal, should a heavy flow of water enter it ; and how, in the dry season, the water in the River is liable to contamination, both from the salt water of the Lake and the filth of the Drains washed into the River by such salt water.

I am indebted to Mr. Kyd for the materials from which the above Table is compiled. The Levels of the Drains are taken from Mr. James Prinsep's Report thereon. The Level of the Lake no doubt varies a little with reference to the River, but probably not above a foot or two in the dry weather ; and in the rains, we know from Capt. Schalch's printed Memoir, that the River rises upwards of 12 feet above the surface of the Lake. Here it is 12 feet 4 inches.

It is manifest from the above Table, that whenever the River shall be admitted into the Canal so as to raise the water in the Canal but $1\frac{1}{2}$ feet above the Level of the Lake, that then will commence obstruction to the Narkooldanga Drain, and so to the other Drains according to their Levels. It is manifest equally that in the freshes of the rains, the bottom of that Drain will be 11 feet under the surface of the River, and that all the Drains will be submerged all of them several feet. Thus it is demonstrated, that the water of the River cannot be admitted into the Canal without limitation, whether that limitation shall be effected by a constricted entrance passage or by Locks formed so as to regulate this without being entirely opened, a measure which does not as yet appear to have been thought of.

Again, with respect to the admission of salt water from the Lake in the dry season, I may be told that, to prevent the pollution of the River the Locks may be shut, no doubt they may, but then how shall vessels freely pass, as Government has hitherto been led to conclude, at all times but during the freshes ? All this diminishes the utility of the scheme so as to present its value in a very different light from that in which that Canal has hitherto been presented to Government, whilst its cost and expences of keeping it clear are greatly increased.

Mr. Prinsep states, the time required to fill the Chamber of the Lock to be $2\frac{1}{2}$ minutes on the average difference of Level assumed at 8 feet : to empty it will require as much : to admit a Boat and to let it out, may, I suppose, be taken at 10 minutes more, and for the manœuvring of the Gates 10 minutes more : in all 25 minutes for passing a Boat or 4 Boats per hour, or 48 per day. But with a Draw-Bridge as proposed, this would block up the Barrackpore Road entirely, therefore, should the passage be opened, a Suspension Bridge is indispensable.

On the whole therefore, whether with reference to the additional expence required for completing the improved plan of the Lock passage, or to the cost requisite annually for

clearing out the shoals formed from the Calcutta Drains, or with reference to the opinion expressed by the Special Committee of Engineer Officers as to the ultimate impracticability of keeping open the navigation of this Canal, or to the objections of a different nature above adverted to by me, I am of opinion, that before any sum shall be further authorized to be expended in prosecuting a work obnoxious to so many objections, and at the most holding out so few advantages, the documents before the Board should be laid before Government, and that this should immediately be done.

I have omitted to notice the farther scheme proposed for remedying the obstruction of the navigation of the Canal from the soil brought into it by the Calcutta Drains, namely, to form Dams or Weirs as they are called, at the mouth of each Drain, where the current of the Drain being intercepted by a higher Level may deposit the soil before the water reach the Canal. But where are these Dams to be formed? where is the room? and if there be, it must be obvious to us all, that no such Dam can be formed that will not raise the bed of the Drain exactly so much as the Dam is raised, and consequently so far obstruct that Drain. Can the Calcutta Drains afford to lose any portion of their slope? I believe not. I believe that on the contrary, their fall of Level is so small as hardly to give any current without rain.

(Sd.) G. A.

No. 103.

No. 4902.

TO THE VICE-PRESIDENT IN COUNCIL.

HON'BLE SIR,

12th April, 1832.

We have the honor to submit for the consideration of your Honor in Council the

Territorial Department.

* Letter from Mr. J. Prinsep, No. 379, of 17th December 1831.

Letter from Lieut. Col. Tickell, No. 2460, of 29th February, and enclosures. Report of Col. Wood's Committee of 23rd January.

correspondence noted in the margin,* relative to a modification in the Locks originally planned for the Circular Canal by Captain Thos. Prinsep, and sanctioned by Government on the 6th January 1829, and

to the great inconvenience resulting from the mud deposited in the Circular Canal by the Calcutta Drains.

2. Captain T. Prinsep's estimate for Locks amounted to Rupees 60,000. Mr. James Prinsep's revised estimate amounts to Rs. 98,912. The causes of the difference are satisfactorily explained in Mr. Prinsep's Letter of the 17th December, and consist in giving a greater depth to the foundation: an increased scantling to the superstructure: an additional pair of small Gates, and a different arrangement of the Draw-Bridges.

3. The majority of the Board approve of all these changes except with respect to the Bridges, for which they think it will be much more convenient to substitute Suspension Bridges, as suggested in the 9th paragraph of Mr. Prinsep's letter.

4. With respect to the proposition contained in the 15th paragraph of Mr. Prinsep's letter, of the 11th February, to substitute one Lock of 30 or 32 feet wide, capable of admitting Steamers, which is approved by Lieut.-Col. Tickell in his letter of the 29th February, we think there are insuperable objections to the attainment of the proposed benefit. In the first place their funnels would probably be found too lofty to permit them to pass under the Bridges. 2ndly, Their passage would dangerously interfere with every other description of Craft in the Canal. 3rdly, There would not ordinarily be depth of water enough in the Entally Canal for Steamers to pass through into the Sunderbunds. 4thly, Gates of great breadth are much more unmanageable than those of a smaller size.

5. Mr. Prinsep himself has acquiesced in the validity of these objections, but is satisfied that he can overcome the difficulties which might be apprehended in the event of a second Lock being required to be added, and in building the first will make suitable adaptations for such an occurrence.

6. There are other reasons which induce the majority of the Board to recommend one Lock instead of two, viz. 1st, The want of data to lead them certainly to expect that the ordinary amount of traffic through the Locks will require two Locks instead of one. If one will suffice, it follows that expenditure upon the 2nd would be thrown away, and 2ndly, Because from the argument detailed in Mr. Prinsep's letter to Colonel Tickell of the 5th June last, from the parallel cases of the Marhatta Ditch, the Bhowanypoor Ditch, (communicating with the Drains near Short's Bazar,) and Tolly's Nulla itself, it is not clear whether a Lock may not be found to be unnecessary, and 3rdly, Because one Lock will apparently give a current in the Canal sufficient to aid in cleansing the bottom from the deposit from the Drains.

7. The majority of the Board have therefore given instructions for the immediate commencement of one Lock of 24 feet wide, the expence of which may be estimated at about Rs. 50,000.

8. With respect to the vast quantity of mud estimated by Colonel Wood's Committee, to have been deposited last year in the Circular Canal, viz. 883,000 cubic feet, the majority of the Board are of opinion, that even assuming the above quantity to be undeniably correct, yet that it cannot be taken as indicating the quantity that will be deposited in future years, because the Bank of the Canal will naturally have been more worn in yearly, than it will be in future years; and because, as the Chief Magistrate has informed the Board, the sides and bottoms of the Drains, between the Circular Road and the Canal, were greatly corroded by the rapidity of the Drainage, and they think on the other hand, that the Committee have underrated the force of the alternate current from the Salt Lake into the River, and from the River into the Salt Lake, in scouring the Canals, and thereby preventing and carrying off deposit. It is calculated, that if one-half of the above great deposit were swept away by the current, the remainder being equally spread over the bottom of the Canal would fill it to a depth of a little more than 3 inches annually. We do not pretend to say that the extent of this inconvenience can be accurately calculated beforehand, but we are disposed to think it has been overrated by the Committee, and it does not form, in the judgment of the majority of the Board, a sufficient reason for declining to complete the Canal, nor for constructing another Canal parallel to the West and South banks of the Circular and Entally Canals, for the purpose of carrying the contents of the Drains into the Salt Lake.

9. Lieut.-Col. Galloway concurs with the Special Committee, of which Colonel Wood was President, and with the Superintending Engineer in the view they have taken as to the impracticability of keeping open this Canal except at an enormous expence. He has entered into that question and other points connected with this work in detail in his accompanying Minute,* which is herewith submitted for the consideration of your Honor in Council.

10. We have to request, that the Original Documents when no longer required be returned to this Office.

(Signed) THOS. ANBURY, *Colonel, Chief Engineer.*

„ A. GALLOWAY, *Lieut.-Col., Member Military Board.*

„ D. MCFARLAN, *Chief Magistrate and Officiating M. M. B.*

„ JOHN CRAIGIE, *Lieut.-Col., Member Military Board.*

* See Paper marked No. 102, of this Appendix.

No. 104.

No. 4903.

FROM THE SECRETARY TO THE MILITARY BOARD,
TO THE SUPERINTENDING ENGINEER, L. P.

SIR,

I am directed by the Military Board to acknowledge the receipt of your Letter, No. 2460, of the 29th ultimo, and to observe, that several objections present themselves to the adoption of the plan recommended in the 2nd paragraph of your Letter, namely : The substitution of one Lock of 30 or 32 feet in breadth for the purpose of admitting Steamers.

2. In the first place : Their funnels would probably be found, too lofty to permit them to pass under the Bridges. Secondly : Their passage would dangerously interfere with every other description of Craft in the Canal. Thirdly : There would not ordinarily be depth of water enough in the Entally Canal for Steamers to pass through into the Sunderbunds. And Fourthly : Gates of great breadth become greatly more unmanageable than those of a smaller size.

3. In a conference with the Chief Magistrate, Mr. Prinsep has admitted these objections to be conclusive.

4. He has further stated that upon a full consideration, of all the circumstances of the case, it appears to him most advisable to construct one Lock of 24 feet wide; and though difficulties might be apprehended in the event of a second Lock being required to be built adjoining or adjacent to the first, Mr. Prinsep is satisfied that they may be surmounted, and in building the first will take measures accordingly

5. The Board concurring in these views, you will therefore request Mr. Prinsep to commence on the execution of this work without delay.

6. You will also give instructions for making the alterations recommended by Colonel Wood's Committee, to the Boitacanna Bridge.

7. With reference to the 9th para. of Mr. Prinsep's Letter of the 17th December, you will request him to submit an Estimate for a Suspension Bridge to be substituted for Draw-Bridges.

16th April, [1832.]

No. 105.

No. 839.

TO COL. SIR THOMAS ANBURY, K.C.B.,
LIEUT.-COL. A. GALLOWAY,
D. MCFARLAN, ESQ., AND
LIEUT.-COL. JOHN CRAIGIE,

Members of the Military Board.

Miscellaneous Revenue.

GENTLEMEN,

Your letter No. 4902, dated the 12th April last, with its enclosures, having been forwarded to the Right Honorable the Governor General, I am directed by the Vice-President in Council to transmit for your information, the accompanying copy of a Letter* received from His Lordship's Secretary in reply, and to intimate that His Honor in Council sanctions the construction of the Lock for the Circular Canal, with a single Chamber, at an expence not exceeding (Rs. 50,000) Fifty Thousand.

2. The original correspondence, which accompanied your Letter, is herewith returned : copies having been kept for record.

I have the honor to be, Gentlemen,

Your most obedient Servant,

J. THOMASON,

Deputy Secretary to the Government.

FORT WILLIAM :
The 3rd July, 1832.

* See Appendix
I. page 33.

No. 106.

No. 1119.

FROM THE SECRETARY TO THE MILITARY BOARD,
TO THE SUPERINTENDING ENGINEER, L. P.

SIR,

I am directed by the Military Board to inform you, that Government have on the 3rd instant, authorized the construction of the Lock for the Circular Canal, with a single Chamber, at an expence not exceeding 50,000 Rs.

The mode of removing soil deposited in the Canal, by bunding and hand labour, has also been approved, and should be resorted to as soon after the close of the rains as the fall of the River will admit, by constructing a temporary Bund across the Canal immediately beyond the shoals, and then drawing off the Stream of the Canal as far as possible by opening the Gates of the Lock at low-water, and employing strong working parties, so as to give as little interruption to the navigation as possible.

10th July, 1832.

(Nos. 107 to 121 inclusive, omitted.)

No. 121. a.

Extract—Annual Report on Canal Operations during the year 1831-32.

2. The state of the whole line of Canals is much the same as it was last year, nor do any of the Cuts appear to have suffered as yet materially from the process of gradual deposit of silt; the spots which were before pointed out, as presenting shoals in the several cross Canals, are perhaps a few inches more shallow and are impassable at low-water; but at high tide, Boats of considerable draught still pass without difficulty—and the Report of Boats which I have kept up to the end of May last shows an average of Five Thousand per month, agreeing with that noticed in the Table I had the honor to furnish with my Report of the 31st December, 1831.

3. I have therefore nothing immediate to recommend connected with the Mofussil Canals for the ensuing season.

12. The deposit of soil from the Dhurmtulla Drain at the head of the Entallee Canal was accurately measured at the close of the rainy season, by sounding in three points of a Section of the Canal at 50 feet. The total, as will be seen by the abstract of these soundings in Appendix E, is 94,250 cubic feet, nearly agreeing with the Estimate made in my Letter of the 10th March, 1831, from the combined effect of six years' deposit, since the former cleaning of this Canal by my predecessor.

13. I am sorry to say that the Canal to the East of the Koolya Bridge, is now rapidly filling up. In the course of a year or two, it will require to be emptied and excavated in gradual portions all the way to the Lake, if it is intended to preserve the navigation unimpeded; the mouth of the Canal towards the Lake is also becoming more and more choaked with sediment since the Dredging Boats have ceased to work in that quarter, but when the opening of the communication with the River through the Lock-Gates shall have shown how far it is possible to clear the line of Canal by hand-digging, it will be time enough to determine what steps shall be taken to remedy the defects of the present Channel.

22. The Dum-Dum Tunnel Drain was made in the same plan as those of Nurkuldanga and Manicktollah, to carry off the water from the Bagh Bazar Division of the Town, formerly

Mofussil Canal.

Deposit from 1825,
to 1831—6)607,833
cubic feet. 100,000
per annum.

Drains.

drained by the Marhatta Ditch, as the main portion of this Drainage travels to the more central Drain at Ooltadanga, and as a Bridge exists near the Thannah connecting the Drains of the two sides of the Road, I did not think it necessary to construct more than one Drain to this Bridge, some alteration was made in the plan of the front towards the Canal, introducing steps on the side walls, which have a better effect than the bluff terminations of the other Drains.

23. Twenty-one cross Drains of greater or lesser size, were found requisite along the line of Pucka Road from Manicktollah to Dum-Dum Bridge.

24. The average charge for them is Rupees 180, or per 100 cubic feet of masonry 13 Rupees 13 annas. They are mostly provided with iron gratings in the gutters on the sides of Road to prevent large stones, &c. from falling in.

29. As recommended in my last Report, the experiment of lessening the slope of one of the City Drains with a view to diminish the quantity of silt brought with the drainage water into the Canal, was tried upon the Northern Drain of the Bythukkhana Road, the deposit does seem to have been lessened thereby, and the bed of the Drain is evidently raised throughout its whole extent, but as this Drain is of minor importance compared to the great Drains of the Nurkuldanga Division, the experiment affords hardly a fair criterion of the effect of such a measure upon them. I hesitated to make the trial at once upon them from a fear that it would inconvenience the Drainage.

30. The table of measurement in Appendix F. exhibits the state of the Canal in front of each of the principal Drains, after the last rainy season. It will be remarked that although the two Dredgers were kept constantly at work ultimately at Ooltadanga, Manicktollah and Narkuldanga, still they could not altogether keep pace with the deposit. Estimating the quantity of mud lifted by each Boat during the season at cubic feet 600 per diem, it appears that the annual deposit at each place in 1832 is nearly as follows—

			Mud taken up by Boats.	Remaining deposit measured.	Total Deposit.
Manicktollah,	..	..	72,000 feet.	37,625 cb. feet.	109,625 feet.
Narkuldanga,	..	..	144,000 feet.	68,333 cb. feet.	212,333 feet.
Bythukkhana,	..	..	..	39,000 cb. feet.	.. ..

being smaller than my former estimate in the ratio, of (say) five to six. I can have nothing to add to my former remarks upon this subject until the opening into the River at Chitpore shall have shown what can be effected by hand-digging towards the removal of the annual deposit.

Chitpore Lock-
Gate.

31. The plan finally approved of, by the Board for the Locks at Chitpore comprehended a single system of Gates on the scale provided by the late Superintendent, with the addition only of a second Canal Gate behind the outer River Gate intended to form a Chamber for the passage of Boats out of the Canal, when the water of the River should be lower than that of the Canal. Upon the receipt of the orders of the Board on 2nd July, I lost no time in digging and laying in the foundations upon this plan, and had the honor to Report their completion in my letter to yourself, dated 20th July, 1832.

The stratum of clay was of a firm nature and extended to the depth of 40 feet below, the foundations as ascertained by boring; at the same time the spread of the foundations was so great, that I did not anticipate any material subsidence. Upon completion of the masonry, however, it was ascertained that the whole mass had settled nearly one inch without affecting the level of any part excepting the detached stairs at the extremities of the wing walls where the steps lost their level to the above extent. The floor of the Lock also not having an equal pressure upon it, did not sink to the same degree, notwithstanding the inverted arch intended to connect it firmly with the side walls: a small crack consequently opened along the central line of the floor, but it was merely superficial, and was easily filled in with fine mortar. The level of the sill-stones was barely affected and by no means to such extent as to need any adjustment.

41. Connected with the Road on the South of the Chitpore, I should also mention that a large Drain will be necessary to clear the Mohulla of Soor Bazar, formerly drained into the Marhatta Ditch. This work may be on the same scale as that on the opposite side of the Canal, and will consequently contain 4,000 feet of masonry and cost about 700 Rupees.

42. I have also lately forwarded to the Military Board a plan and estimate for walling and tunnelling the Western portion of the Marhatta Ditch, up to the old Bridge, as it will pass under the new Road, leading to the Lock Bridge. The estimate for this work was 2,315 Rupees, 4 annas.

43. Accurate plans have been made by Surveyor Turner of the ground purchases available on each side of the Canal, divided into suitable portions, numbered, and the measurement of each calculated, and entered in Tables furnished to the Aumeen of Canal purchases in the Office of Mr. MacFarlan.

No. 121. a.⁽⁵⁾

APPENDIX E.

Statement of Mud deposited in the Entalee Canal from Durmtula Drain to Koolya Bridge in 1832.

Length.		Breadth.	Depth of deposit.	Cubic feet.	REMARKS.
Ft. in.		Ft. in.	Ft. in.	Ft. in.	
Durmtula Drain	50 0	30 0	3 0	4,500 0	
to	100 0	30 0	4 0	6,000 0	
to	150 0	30 0	4 9	7,125 0	
to	200 0	30 0	4 2	6,250 0	
to	250 0	30 0	4 8	7,000 0	
to	300 0	30 0	4 6	6,750 0	
to	350 0	30 0	3 2	4,750 0	
to	400 0	30 0	3 5	5,125 0	
to	450 0	30 0	3 5	5,125 0	
to	500 0	30 0	2 4	3,500 0	
to	550 0	30 0	2 0	3,000 0	
to	600 0	30 0	1 8	2,500 0	
to	650 0	30 0	1 1	1,625 0	
to	700 0	30 0	1 0	1,500 0	
From 750 to 1,750, ..	1,000 0	30 0	0 6	15,000 0	
From 1,750 to 3,150, }	1,450 0	30 0	0 4	14,500 0	
Total, ..	3,150 0		Cubic feet,	94,250 0	

SUPT. CANALS' OFFICE :
31st December, 1832.

JAMES PRINSEP,
Superintendent Canals

No. 121. a.^(b)

APPENDIX F

Table of Deposit Mud in the new Canal between Bythukkhana and Manicktola.

BYTHUKKHANA.

	Depth of Bed of Canal below revetment		Depth of deposit in 1832.	Length.	Breadth.	Cubic feet.	REMARKS.
	In M-y. 1832.	In October, 1832.					
150	9 9	10 4	.. .	50 0	80 0		
100	10 0	8 10	1 2	. ..		4,666 8	
50	9 3	8 4	0 11	. . .	.	3,666 8	
..	10 8	7 10	2 4	. ..	. ..	9,333 4	
..	9 7						
50	9 9	8 4	1 5	.. ..	. . .	5,666 8	
100	9 9	8 4	1 5	.. .	.	5,666 8	
150	9 7	8 4	1 3	. ..	. . .	5,000 0	
200	9 7	8 4	1 3	. . .	.	5,000 0	
250	9 7	9 7	.. ..	. ..	. . .	. ..	
Total cubic feet,						39,000 0	

There is some uncertainty about the soundings in this measurement.

J. PRINSEP,

Superintendent Canals.

No. 121. a.⁽⁶⁾—(Continued.)

NURKULDANGA.

	Depth of Bed of Canal below revetment.		Depth of deposit in 1832	Length.	Breadth.	Cubic feet.		REMARKS
	In May, 1832.	In October, 1832						
300	8 7	8 3	0 4	50 0	80 0	1,333	4	
250	8 2	8 1	0 1	.. ..	.. ..	333	4	
200	7 11	6 10	1 1	. ..	..	4,333	4	
150	9 7	6 11	0 10	. ..	. .	3,333	4	
100	6 11	6 5	0 6	. ..	.. .	2,000	0	
50	7 1	6 11	0 2	.. ..	.. .	666	8	
	6 10	5 7	1 3	. ..	.. ..	5,000	0	
50	6 11	5 3	1 8	. ..	.. ..	6,666	8	
100	6 5	4 7	1 10	.. ..	.. ..	7,333	4	
150	5 9	4 7	1 2	.. ..	.. ..	4,666	8	
200	6 5	4 4	2 1	.. ..	.. ..	8,333	4	
250	6 5	4 8	1 9	.. ..	.. ..	7,000	0	
300	7 6	4 8	2 10	.. ..	.. ..	11,333	4	
350	7 2	6 1	1 1	.. ..	.. ..	4,333	4	
400	6 10	6 5	0 5	. ..	.. ..	1,666	8	
450	6 11	7 3	.. ..	.. ..	.. ..	.. ..		
Total cubic feet, ..						68,333	4	

Besides about 240 days' work of one dredger taking up on an average 600 cubic feet per diem = 144,000 cubic feet.

J. PRINSEP,
Superintendent Canals.

No. 121. a.⁽⁶⁾—(Continued.)

MANICKTOLA

	Depth of Bed of Canal below revetment.		Depth of deposit in 1832.	Length	Breadth	Cubic feet	REMARKS
	In May. 1832.	In October, 1832					
150	10 9	9 10	0 11	50 0	70 0	3,208 6	
100	10 11	7 6	3 5	.. .	.. ..	11,958 6	
50	8 9	6 4	2 5	. ..	. ..	8,458 6	
..	9 11	8 7	1 4	.. .	. .	4,666 0	
50	7 3	8 0	0 9	.. .	. .	2,625 0	
100	7 7	8 0	0 5	.. .	. .	1,458 6	
150	10 0	8 10	1 2	.. .	. .	4,083 4	
200	9 9	9 5	0 4	. .	. .	1,166 8	
Total cubic feet,						37,625 8	

Besides about 120 days' work of one dredger taking up 600 cubic feet per diem = 72,000 cubic feet.

CALCUTTA,
SUPT. CANAL OFFICE:
The 31st December, 1832.

J. PRINSEP,
Superintendent Canals.

(No. 122 to No. 126, inclusive omitted.)

No. 127.

FROM CAPTAIN F. JENKINS,

On Special Survey.

To CAPTAIN G. YOUNG,

Secretary Military Board

Calcutta, 29th June, 1833.

SIR,

I have the honor to acknowledge your letter No. 904, of the 25th instant, calling upon me to submit to the Board such observations as I made on the state of the Eastern Canals on my late passage through them.

2. That the Board may be able to form the better judgment on the observations and suggestions I shall have the honor to offer on the state of the Canals, and measures for their improvement, I conceive it may not be unnecessary to premise a summary account of my progress through the Canals

3. I reached Bussunt Golah in a 600 maunds Dacca Pulwar, light, about 5 P. M. of the 25th, carrying with me the last of the flood, and reached the mouth of the Hosseinabad Canal a little after the commencement of the ebb: the stream was then running gently into the Canal, but towards the end of the ebb it set into it with considerable violence.

Finding, I could not proceed at night, I anchored and weighed next morning (26th) at daybreak. At the time of starting there was still a good flood in the Juboona, and I had to proceed* against the current in the Canal, but the current was very slack, and to the point B (of the Map), I got on tolerably well, there being more or less convenient tracking ground: from B to C there being no tracking ground, I had to proceed on my oars, and so also from C to D, but approaching towards the point D, I had the advantage of a slight set of the ebb into the Gobragong, but to get through the Gobragong into the next artificial Cut, I had to get over the ebb, which was already setting out so strong as to make the labour severe. I could not pull against it with oars, and from the depth of the mud poling was almost impracticable. Under ordinary circumstances the Boat would have stopped, for that ebb at the fork of the Gobra below D, not having accomplished $3\frac{1}{2}$ miles, but I exerted the crew and my servant and reached the artificial Cut with great difficulty. Here I found the tide still against me, the Embankment was overgrown with jungle nearly to the point F, and prevented my tracking: at this point there is a partial cultivation, and I had just commenced proceeding on the *goon* with a very slack current in my favor when my Boat, not drawing 2 *haths*, was stopped for want of water: this was about $9\frac{1}{2}$ A. M. At the end of the ebb we were left completely dry upon a hard sandy bottom that might have been fatal to a laden Boat. At half an hour after 12 I floated and reached G, on the *goon*, but there being no tracking ground further, I had to wait until near 4 P. M. for the flood to slacken. I then made way against the flood into Cheetpore Gong, and with the remains of that flood I ran up to and through the next artificial Cut, "proposed line" of the Map. I reached the Cheetpore Gong, I should remark, with difficulty, and if I had not succeeded I must have stopped at X, during the following ebb.

On reaching the end of the last mentioned artificial Cut, I found the tide still strong in the Chaytel, and had to wait for the ebb.

About 8 P. M. I dropped down to the Choomooh Gong, a large fine river, and there stopped for the next flood. The wind had been westerly all day but very light; had it been at all strong, I know not what my progress would have been, scarcely any thing however.

About $9\frac{1}{2}$ A. M. 27th, I started with the flood, reached Kooltee at 8, and carrying the last of the tide turned into Kooree Khal, whence my progress to Dhara was very slow, the tide before I reached the village having turned, and there being no tracking ground. At this village commences another artificial Cut, and here I met good tracking ground, and reached the point L against the ebb without difficulty, but between Morissa and L, I dragged the ground, and was nearly being stopped. The Canal runs dry at this point, and my detention would have been great had I not succeeded in clearing the spot.

From L, I dropped down to M, with the ebb, (I know not how the water of this Nullah makes off). From M, tracking through the artificial Cut N, with a very strong ebb, I left my Pulwar about 12 A. M. expecting delays in her, and got into a light fishing Canoe.

At O, I found two moderate-sized laden Boats aground on very hard *cunkur* ground. From O to P, I was carried down with a strong ebb, but at P, I met the ebb, and it ran with such strength that even my Canoe was unable to make way against it with oars, and the fishermen were obliged to track through the mud until near Bahmunghotta. From Bahmunghotta to Balliaghat I continued against the stream all the way, although the flood had set in before I reached Manickgunge, but it being then the dead of the neaps, the flood only swelled the waters, did not turn the current, at least not till I reached Balliaghat at $4\frac{1}{2}$ P. M.

My Pulwar reached Ballaghat that night, having been brought up from P, before a heavy Easterly gale, which commenced about 4 P. M *

4 To understand the value of the passage by the Canals for laden Boats, it is necessary to advert to what would have been my progress by the usual Sunderbund route under ordinary circumstances. On the turn of the tide on the evening of the 25th I should have dropped down without any detention and reached the Ragmungul [? Roymungul] with ease on that ebb. With the flood of the morning of the 26th I should have proceeded up the Ragmungul and stopped at half-flood at a place called Rampoorah, where a counter-flood is met. On the flood slackening there are two or three reaches to be got over against it (the ebb sets the same way as the flood here until very late) when the ebb is reached, this serves only for 2 or 3 reaches when the turn is against the ebb at the mouth of the Attara Banka, the ebb is slack and after 2 or 3 more reaches it is found to set into the Amjeeree and that point is generally to be gained in one ebb from the Ragmungul. Had I succeeded in doing this the morning's flood of the 27th would have taken me to Ballaghat, and had I not been successful in the difficult part of the navigation through the Attara Banka, I should have reached Calcutta, at any rate, at the same time as by the other route. From the Amjeeree up, the South-westerly wind then prevalent would have assisted progress, but in the Canals would not have been available, and it is to be recollected that I only brought a light Pulwar through the Canals in two days by great and continued exertion, and by the chance of not meeting a strongly westerly wind, and being latterly favored with an easterly gale

5 The objects in view in planning the Canals were I conceive, to shorten the passage for Boats in general, from the Juboona to Calcutta, and to avoid the difficulty and risk of dropping down to the Ragmungul and crossing it in the height of the South-westerly Monsoon but these have been imperfectly attained from the deficiency of the sections of the artificial Cuts and from the want of tracking grounds. In the old route heavily laden Boats can make way against even a strong wind aided by and dropping with the strong currents. In the Canals the currents generally are very weak except in such parts of the artificial Cuts as are immediately adjoining the deep natural Nullahs, and there only at the end of the floods is the set of the stream strong. The operation of dropping with a tide requires however a considerable width of river for it is analogous to the beating to windward of sailing Boats, and there is not a part of the Canals in which this mode of progressing could be available except for a short distance in the Choomooh Gong, from either want of width in the Nullahs or want of force in the current

The want of tracking grounds will therefore ever prevent the Canals from being used by large and laden Boats extensively. were Boats able to track the want of depth at certain points of the Canals would be of less consequence, as the Boatmen could rely on getting over a certain extent of ground in a given time, against even moderately strong winds and counter-currents. Not having their *goons* to depend on they cannot calculate their progress, and must be subject to frequent unnecessary detentions, stopping in the natural Nullahs, afraid of venturing into the artificial Cuts lest they should be left dry and broken up

With the slightest air against a laden Boat of any size, progress with oars, except assisted by a stream, is quite impracticable, and with poles most laborious and most tedious, particularly where the mud is deep and retentive as is generally the case of these Canals.

6. The parts of the Canals in which it is most requisite to establish tracking grounds, are, firstly, that part from A, at the Juboona to X, at the Cheetpore Gong, a distance of about 7 miles: this must always be an extremely difficult part, but it would certainly be always got over during the last of the flood and first of the ebb with the command of a good track-

*The difficulties encountered by Capt Jenkins do not appear to have been generally suffered by other persons. — Was the time selected by Capt. Jenkins in passing the tide Channels the same as is usually selected by others? — J. M.

ing ground, the Embankments for the greater portion of this distance will afford a tracking ground at the mere cost of cutting down the small timber, which should never have been allowed to spring up. The other parts along the banks (on one side only) of the natural Nullahs will require a low causeway of 3 or 4 feet, and the expence will be somewhat heavy, but it appears to me unavoidable if the Canals are to be rendered of extensive utility. Secondly, from the commencement of the Kooree Khal to Dhara—here very little labour is required, there are village embankments generally all along, and there is jungle on the foreground, only that needs to be cleared away. But here some bunds will also be required. Thirdly, from P, to Bahmungottah or to the Nullah coming up to the Sunderbunds, the ground is high and the formation of the tracking path would be very inexpensive, and Fourthly, from the Cut into Chaytel down to the Choomooh Gong, about three-quarters of a mile, the country is inhabited, but the banks are wooded and give no tracking ground.

It would of course be desirable that the Embankment should be continued from one end of the Canals to the other, most desirable from want of roads through the country, and the straight and convenient communication these bunds might be made to afford, but they are less necessary between the points just noticed to assist the Navigation of the Canals.

From X, to the Chaytel for instance, the distance can always be performed in one tide either way, and so also from the Choomooh Gong to the Kooree Khall, and likewise from Bahmungottah to Balliaghat.

The 4th proposed short Embankment would enable light Boats to go in one tide from Cheetpore Gong to Kooree Khall in one flood* with ease, for they could readily track against the current in the Chaytel, but as that reach has a Southerly and Northerly direction in the Monsoon, it would be mostly impracticable to get over even that short distance against the tide and the wind, which there must be constantly adverse.

* Six in original.—J. M.

7. The Canals I found frequented by numerous light Boats, especially the Boats carrying *pawn* leaves, which, with 4 or 6 oars, knowing the precise periods for setting out, can always reach Calcutta from Juboona within 24 hours. The other Boats I met were generally Sawarree Boats or Boats of the intermediate country, and I also met many large return Boats; to these Boats the Canal is very useful—they have a fair wind nearly from one end to the other at that season, but by the old route, they would have had to drop down the Amjeerce against a strong wind, which in their light state would have been particularly tedious. I only met 2 or 3 laden Boats of size coming from Calcutta.

8. The country on the Juboona is a particularly rich and thickly populated country, and the Canals now seem to be chiefly valuable, as connecting it and the intermediate tract with Calcutta: by the light Craft of the natives the passage by them can be made with more expedition than by the lower passage and with perfect safety, the other is often to such small Boats dangerous and frequently impassable, it is likewise almost totally through heavy jungle, whereas the Canals have the advantage of passing always near cultivation, often through it; and from Kooltee Chultabareah, with the exception of the Northern Bank of the Kooree Khall, the country is fully cultivated, and has the advantage of higher ground than any where in the vicinity of Calcutta. There can be no doubt but that the whole line of the Canals will, before long, be brought under cultivation, and the period will be shortened by every measure adopted to improve their navigableness. The establishment of a continued tracking ground and road would tend most materially to promote the extension of cultivation and to render accessible to the Calcutta markets the resources of rich and improving tracts now in a manner cut off from the want of convenient communication.

9. Besides the Embankments I have recommended, it would of course give additional value to the Canals were the shallow parts before alluded to, deepened. In the three particular points noticed near F, L, and O, the subsoil is firm; any additional cutting would

be easy, and I think of permanent advantage: for I did not observe any thing like a deposition of silt at those points, the defects are in the original construction of the Canal not owing to any subsequent filling up with mud or sand.

10th. I have only to make one further observation—it seems desirable to ascertain how far it might be practicable to increase the body of water in any portions of the Canals by damming up Nullahs to the North* of them, and so diverting their streams into the artificial Cuts. The feasibility of doing so can, however, not be well decided on without a considerable knowledge, not only of the Canals but of the other streams intersecting the country. It occurred to me that at the Eastern end of the Canals some improvement by such diversions might be effected, especially between the Gobragong and Cheetpore Gong, but from imperfect acquaintance with the Canals I am unable to do more than thus advert to the subject

(True Copy.)

G. YOUNG,
Secretary Military Board.

* To the South—as the Nullahs to the North serve as receivers, and at the same time keep up a high level, and act as scours to the Canals—J M

No. 128.

No 1241.

FROM THE MILITARY BOARD,

To THE RIGHT HONORABLE LORD W. C. BENTINCK G C B,

Governor General in Council,

Fort William 16th July, 1833.

Department of Public Works

MY LORD,

Capt. Jenkins'
Report on the state
of the Eastern Canals.

Having requested Captain Jenkins to favor us with such observations as had occurred to him on the state of the Eastern Canals during his late passage through them, we have the honor to lay before Government the annexed Copy of his reply, dated the 29th ultimo.

2. We are much indebted to Captain Jenkins for his Report, and the judicious suggestions which it contains. We have drawn the attention of the Superintending Engineer and the Superintendent to them.

We have the honor to be,

My Lord,

Your Lordship's most obedient and humble Servants,

T. C. ANBUREY, *Colonel, Chief Engineer.*

A. GALLOWAY, *Lieut.-Col, Member M. B.*

D. McFARLAN, *Chief Magistrate and Member M. B.*

J. CRAIGIE, *Member M. B.*

(No. 129 omitted.)

No. 130.

No. 65.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO CAPTAIN G. YOUNG,
Secretary Military Board.

Calcutta : 24th July, 1833.

SIR,

I have the honor to acknowledge the receipt this day of your letter, No. 143, of the 16th July, accompanied by a Report on the Eastern Canals by Captain Jenkins.

2nd. I am happy to observe, that Captain Jenkins, on whose opinion the Military Board place so much value, supports my opinion on the necessity, or rather advantages of making Tow-paths along certain portions of the Eastern Canals.

3rd. The proposition or suggestion of the establishment of a continued tracking ground and Road "along the whole line of the Canals" is quite impracticable, as Captain Jenkins would have discovered if he had landed in the jungle at high-water in several places, and even a more limited extent of tracking paths of one-half the dimensions proposed, would in expence far exceed any advantage likely to arise from them. If Captain Jenkins had forwarded an estimate of the expences and the probable advantages of his suggestion, as is customary, he would have at once seen the futility of the scheme.

4th. The present Canals are more than sufficient for the intercourse with the adjoining country, supposing every Beegah of it under cultivation, as nearly one-half the land on the Banks and its vicinity is now cultivated, and the Canals would admit, without any inconvenience, of 8 or 10 times the traffic now on it.

5th. The three particular points remarked as requiring deepening, are those points where Captain Jenkins met with the low tide. The exact depths will be observed in the Appendix to my Report.

6th. The utility and practicability of damming up the Nullahs communicating with the Canals, has been considered very fully and in detail by my predecessors Major Schalch, Captain Prinsep, and Mr. Prinsep, and any remarks I could make on that subject would be superfluous.

7th. My observations on the height of the Banks and adjoining country differs from those of Captain Jenkins in many places. I do not know whether he has made allowance for the height that the tide rises to, as there are no depths of water given where the height of the Banks are remarked.

8th. These observations would have been uncalled for on my part, if I had been informed of Captain Jenkins' intended Report, when I would have had much pleasure in accompanying him on his survey.

I have, &c.,
(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(No. 131 to No. 132 inclusive, omitted.)

No. 133.

No. 755.

EXTRACT—LETTER FROM LIEUTENANT COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces,

To CAPTAIN G. YOUNG,
Secretary Military Board.

Barrackpore : 2nd July, 1833

" 5th. The manner of working the Locks, and quantity of water to be admitted into the Canal, can best be regulated by experience hereafter, but if the Tide be allowed alternately to ebb and flow through it as contemplated by some, a deposit of silt must be expected, which can only be removed at a considerable expence. The quantity of sand however held in solution, is much less than was supposed : for Captain Forbes has proved by experiments that a cubic foot of Ganges water, during the rains contains only a cubic inch of sand, and from similar experiments made by Mr. James Prinsep, it appears that the Sunderbunds water contains a similar proportion of silt, so that no greater a deposit may be apprehended by the admission of the Ganges water into the Canal than from that of the Sunderbunds.

Para 7.

" 6th. Appendix A. is a rough Plan and description of one of the proposed Cess-pools, the expence of which Captain Thomson estimates at about 700 Rupces each. The plan is certainly well worth the trial, and having been found to answer in England, there is no good reason to suppose why it should not prove equally successful here, for nothing possibly can be more fatal to the Circular Canal than allowing it to remain as at present the common sewer or receptacle for all the silt and filths brought down by the City Drains, which, if not constantly removed, would soon render it unnavigable opposite to the mouths of the several Drains, and the Dredging Boats, hitherto employed for the purpose of clearing it away, prove an equal impediment to the navigation, by blocking up the Channel and leaving scarcely room for a Paunsway to pass.

" 7th. Each of the City Drains has been calculated to discharge annually 100,000 cubic feet of silt, which enormous quantity is most probably owing to the earth, &c. taken out by the scavengers being usually thrown up loosely on the sides, the whole or greater part of which is consequently washed into the Drains again by the next shower of rain : this should be most strictly prohibited ; and might, I imagine, be easily prevented by the European and Native Overseers attached to the Conservancy Department, and one-half the expence occasioned by these Drains might thus probably be saved.

Paras. 25, 26.

" 8th. Captain Thomson is of opinion, that Dredging cannot altogether be dispensed with, and intends to make a trial of hand-dredging, as is practised in the Thames and in Holland : the machinery employed is cheap and simple, and the work may be done by contract, and a trifling expence for establishment. He also suggests the expediency of using the Steam Dredging Boat in the Canals, should it ever be available for such purposes, and submits a Comparative Estimate B. of the expence of working with it and by hand labor. It may be found useful hereafter, I dare say, in clearing out the Eastern Canals in the Sunderbunds, as occasion may require. But I should hope Cess-pools may be so arranged and constructed, as to obviate the necessity of employing Dredging Boats of any description in the Circular or Balliaghatta Canals, which, as before, observed, are rendered impassable, except for the smallest Boats, so long as they are at work.

Para. 9.

" 9th. The plan and description here proposed by Captain Thomson, I would recommend to be carried into effect in the course of the usual repairs, and clearing out of the

Canal—the Banks having already settled down from a slope of 2 to 3 to 2 to 1, as appears by the accompanying rough Section marked C. Another Section was taken between the Barackpore and Dum-Dum Bridge, and a third between the Balliaghatta Bridge and Entally Canal, the whole showing the same result: no further injury to the Banks, of any great extent, may therefore be anticipated.

“ 11th. Little alteration, I imagine, can be effected at present on the Northern Bank, (of the Balliaghatta Canal) without incurring considerable expence in the purchase of Ground and Houses, &c. greater part being covered with small brick Houses and Huts, leaving a bad and narrow Road between them and the Canal, which appears to be very little used,—the Road along the Southern Bank being the principal line of communication between Calcutta and Chingrahatta or the Fish Bazar, where it terminates at the Salt Water Lake.

“ 12th. The pukka Road along the west Bank of the Circular Canal is but little used except by hackeries laden with firewood, and although a good deal worn down, does not appear to require any repair at present. The space between it and the Canal, as also that corresponding on the opposite side, should be particularly attended to, all hollows filled up immediately as they appear, and the level so preserved as to conduct the water back into the side Drains of the Road, instead of allowing it to fall over the Banks into the Canal. This and such other repairs, as the Banks may require, where they have slipped in, should be executed with as little delay as possible, and the mouths of the side Drains made pukka where they enter the large City Drains, as proposed by Captain Thomson, in order to preserve them from the effects of the current.

Para. 15.

“ 17th. Within a few days after the Lock was opened at Chitpore, I understand that nearly one foot in depth of the soft mud at the bottom of the Canal was washed out by the current, the average rate of which was about a mile an hour.

“ 20th. In consequence of the crowded state of the Balliaghatta Canal throughout its whole extent, the Circular Canal may be said to be shut out from all intercourse with the Sunderbunds except for Boats of the smallest description, and must ever remain so until some arrangements are made and enforced, for preventing Boats from collecting and remaining there longer than a certain period, sufficient for the discharge or taking in of their respective cargoes, when they should be obliged to move out to the Channels North and South of Chingrahatta, and if those Channels do not afford sufficient room and convenience, Basins might be excavated at no very great expence between Chingrahatta and Balliaghatta, and the earth taken out, most usefully employed in the formation of a Towing-path along the Lake Channel, and in closing up all the outlets from the N. W. Division for the purpose of producing a stronger current than now exists in the Balliaghatta Channel, and thus clearing away the Deposit at the mouth of the Canal.

“ 21st. Tow-paths along the Khals mentioned by Captain Thomson are very much required, and when once completed should be carefully maintained in an efficient state, by cutting down the jungle every year which would otherwise spring up and render them as useless as is already the case in some parts which were cleared about a year, or a year and a half ago. Now that the rains have set in, and the Bhagretty and Jellinghy are open, the Eastern or Mofussil Canal are but little frequented, and as the season is unfavorable for such operations, I would recommend that the formation of the Tow-paths be deferred until the commencement of the cold weather, when no time ought to be lost in putting the whole into complete order, as proposed by Captain Thomson in paragraph 36.”

Paras. 32 to 36 inclusive.

No. 133. a.

No. 44.

EXTRACT—LETTER FROM CAPTAIN J. THOMSON,
Superintendent of Canals.

To LIEUTENANT COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta: 18th June, 1833.

" 4th. As every future operation on these Canals will depend on the manner of working the Locks, so as to regulate the current and the height of water, I have here stated my opinion (drawn from previous Reports,) and have the honor to request your early instruction on this point. Judging from Captain Prinsep's original intention, and the subsequent Reports of many able Officers, it would appear that if a current was permitted to run always when the state of the Tide would permit) from the Hoogly to the Salt Water Lake, it would hold out many advantages over either an alternate ebb and flow, or a current from the Lake to the River. In the first instance, the water in the Canal would be deeper, and would be fresh nearly to the Lake; and I have no doubt but that, in the course of a year, the water in the nearest part of the Lake would be freshened, holding out an inducement to take into cultivation such portions of the Lake as are on a sufficiently high level for that purpose.

" 5th. It was at one time apprehended that, if the waters of the Hoogly were admitted during the rains into the Canal, the sediment deposited would silt it up; but better information as to the quantity of earth in solution shows that no fears of this kind may be apprehended.

" 6th. The greatest current that can be admitted into the Canal, without injury to the Banks, and the consequent height of the water at the Lock-Bridges, and other obstructions, can only be accurately known from experiment: about $2\frac{1}{2}$ or 3 feet head of water at the Lock, and about 17 inches per second velocity, will be probably near the truth; and to make my remarks on the drainage of the City of Calcutta, &c. intelligible, I shall suppose that height and velocity.

See Appendix A.

" 7th. Considerable expence and difficulty has been anticipated in the removal of the sediment brought down by the City Drains, and deposited in the Canals. That which appears to me the best mode of preventing its admission into the Canals, and facilitating its removal, is by a Cess-pool at the end of each Drain. The large quantity of this sediment brought down by each of the Drains, 100,000 cubic feet in the year, is scarcely credible, but notwithstanding, I have no doubt of the efficiency of this method, as I have seen its success in many instances.

<i>Probable cost of one Cess-pool.</i>			
Excavating, ...	Rs.	205	
Brickwork, ...	"	256	
Woodwork, ...	"	140	
Value of land and contingencies, ...	"	99	
	Rupees	700	

It is at all events worthy of trial, but I am not yet prepared with a detailed Plan and Estimate of a Cess-pool, not having sufficient information on the quantity of water discharged and some other particulars. To acquire accurate information on these points will occupy my immediate attention; but the expence may be roughly stated as follows: the sediment A Boat will take 50 Tons. 1 mile for 1 Rupee.
 $700,000 = 35,000$ Tons.
 $35,000 \div 50 \times 3\frac{1}{4}$ miles = 2,270 Rs.
 530 Rs. Superintendence, &c.

of the 7 Drains amounting to 700,000 cubic feet may be removed by water carriage into the Hoogly or Salt Water Lake for about 2,800 Rs. a year: removing it

Highest vis

Level of the coping of it

The proposed alteration is shew

there being no communication between the Canal and it at Balliaghatta. It is recommended that a cutcha Road be made there, 850 feet long, and 30 feet wide at top; expence about 100. Rs.

" 14th. The probable expence of making these alterations will be from 5,500 Rs. to 7,000,

Repairing and altering the Banks and Roads of the Circular Canal, and $\frac{3}{4}$ mile of Entally.

$$\begin{array}{r} \text{B} \quad \text{D} \quad \text{L} \\ 30 \times 2 \times 42240 = 25,34400 \end{array}$$

$$\begin{array}{r} 730 \quad 730 \\ = 3472 \text{ choukas @ } 1 \text{ R.} = 3472 \text{ Rs.} \end{array}$$

Cutting down the Road of Balliaghatta Canal.

$$\begin{array}{r} \text{B} \quad \text{D} \quad \text{L} \\ 25 \times 2 \times 21400 = 10,70,000 \end{array}$$

$$\begin{array}{r} 730 \quad 730 \\ = 1466 \text{ Choukas @ } 1 \text{ R.} = 1466 \text{ Rs. ;} \end{array}$$

making 200 Ramps.

$$\begin{array}{r} \text{N} \quad \text{B} \quad \text{D} \quad \text{L} \\ 200 \times 5 \times 16 \times 50 = 800,000 \end{array}$$

$$\begin{array}{r} 730 \quad 730 \\ = 1096 \text{ Choukas @ } 1 \text{ R.} = 1096 \text{ Rs. ;} \end{array}$$

3472
1466
1096
6034 Rs.

not including the expence of disposing of the earth. If the earth taken out of the Canals is placed on the Banks, it will be liable to be again partially washed into the Canals and Drains; and it will cause the Banks to slide, and also reduce the width of the Road; it would therefore be necessary to carry the overplus earth by Boats either into the Hoogly or into the Salt Water Lake; in the latter case, it will be required for Tow-paths there, to be hereafter mentioned.

" 15th. The pukka Road along the west Bank of the Circular Canal is worn down, and the position and slope of the Drains require in some places to be altered, so as to prevent the water running over, or through the Banks into the Canal. This alteration of the Drain and partially of the Road, will depend on the alteration proposed in the 9th paragraph. The traffic along the East Bank does not appear so great

as to induce me to recommend the Road being made pukka on that side, except at the Basin, where it is now nearly finished by Mr. Prinsep: with respect to these Roads generally, I would think it not necessary to expend more than is required to preserve the Banks of the Canal;

Making Pukka mouths of Drains about

$$\begin{array}{r} \text{N} \quad \text{B} \quad \text{D} \quad \text{L} \\ 60 \times 5 \times 1 \times 10 = 3000 \text{ cubic feet} \\ 3000 \text{ cubic ft. @ } 16 \text{ Rs. per } 100 \text{ ft.,} = 480 \\ 8000 \text{ yards of cutcha Drains @ } \frac{1}{2} \text{ Rs. per } 100 \text{ ft.,} \dots = 400 \end{array}$$

Rupees 880

and as the traffic increases, the Roads would have to be improved to give an easy access to the houses on the Banks. The only expence at present recommended, is the alteration and improvement of the back Drains of the Circular Canal. The alteration

proposed is to make the mouths of these Drains pukka at the place they enter the large Cross Drains, in order that the current may not alter their slope, and thereby cut away the Roads and Banks of the Canal. I estimate this at about 800 Rs.

" 16th. The Bridges over the Circular Canal are in nearly the same state as when reported on by the Committee (9th August 1831), as I am informed: all the standards of the Narkuldanga and Manicktollah Bridges are cracked in a degree more or less, particularly the former Bridge. The Sketch of the N. E. Pier will show the direction of them. These cracks are reported to have been caused by hanging the Bridge on the chains. There were no rollers under the chain, and they necessarily dragged the standard forward. These cracks change with the temperature of the day and night, and there was a perceptible alteration in them, caused by the gale of the 22nd ultimo. The bolts of the back chains of these two Bridges appear bent and injured materially by the manner in which they have been wedged. The bolts of this Bridge are nearly 2 inches in diameter, which is about half the strength they ought to be.

Instead of $2\frac{1}{2}$ inch.

" 17th. If the Narkuldangah Bridge had not stood so long as it has done in its present state, I should have considered it unsafe. I will forward an Estimate of Expence of rebuilding the standard and repairing the ironwork, if called for. And if it is repaired, I will be able to judge from the state in which I find it, whether the Manicktollah [Bridge] will require a similar alteration.

" 18th. It will be found expedient, as soon as the Locks at Chitpore are open, to procure ballast to throw down to protect the Banks of the Canal at the following places:

Foot of the east wing walls of Locks, about	.. .. .	50	Tons.
Ditto ditto, of 4 Bridges, .. .. .	.. .. .	30	"
or 3, .. .. .	.. .. .	90	"

This may be done for about 50 Rs. 170 Tons.

" 19th. With regard to keeping an accurate account of the shoaling of the Canal at particular points, I have met with difficulties I did not expect; generally throughout the Canals but more particularly in the Circular Canal, I found the mud so very soft that I could not determine the depth of water within 6 inches, and that approach to accuracy was made by the mark of the mud upon a white coloured rod being deducted from the total depth. The soft mud is in the Circular Canal, from 18 inches to 2 feet deep, and will most likely be carried away by the current when it is admitted from the Hoogly.

" 20th. I will pursue the following method of ascertaining the shoaling: Gauges will be fixed at every mile of the Canals, and 6 to 8 sets of soundings in the year will be made with such accuracy as may be practicable, and although no two sets may agree, yet an average of several will approach to accuracy.

" 27th. The work to be done on these 2 Canals may be summed up as follows.

" 28th. Whenever the Bank has fallen in or requires much repair, the section of the Canal will be made according to Sketch proposed. The Bank and Road along the north side of the Balliaghatta Canal to be then completed; and at the same time the Balliaghatta Road repaired, and the cross Road at Chingreehatta made when authorized. The other repairs and alterations will be made when I receive instructions to that effect.

" 29th. Immediately connected with the Circular and Balliaghatta Canal is the entrance* of the Eastern Canal, which is liable to be choaked up by the sediment brought down from the former Canals.

* At Chingreehatta.

" 30th. The current admitted into these Canals at the Locks will have but little influence on this point, as it will meet the rising tide about that place. And when the tide falls, the current out of the Canals will not much exceed what it now is, because the Canal will be on a higher level than the Lake, the current from which will be thereby prevented entering the Eastern Canal at Balliaghatta. It has been proposed by Mr. J. Prinsep, and I believe already approved of by the Military Board, to make Tow-paths along the Lake Channel. If the Embankment for the path is made along the N. E. side of the Lake Channel so as to close up all outlets from the North-western division of the Lake, except the one at Balliaghatta, the Lake would serve the purpose of a reservoir to clear out the head of this Canal.

" 31st. Mr. Prinsep has pointed out to me the convenience to the public of a place to lay up empty Boats, &c. by deepening and cutting many more Docks in this Channel opposite to Balliaghatta. If the current therefore, at a moderate expence, can be forced through this Channel, great advantages would arise from it. The particularity [?] practicability] of it can only be ascertained by experiment or trial, as it would be impossible to take accurate levels on the Lake.

" 32nd. It will be remarked by a reference to the Appendix, that little or no change has taken place in the Eastern or Mofussil Canals. Doubts have been raised respecting the utility of these Canals; and I am not prepared from personal observation to form an opinion on this subject, and consequently to propose or recommend any considerable expenditure in order to put the Banks in proper order so that they would remain permanent, or for digging out any of the shallows. But there is one very great drawback to these Canals in the want of Tow-paths between one Canal and another at the several places remarked in the

Mofussil Canals.

Appendix. With these Tow-paths and very ordinary precaution on the part of those passing through the Canals, there would be no stopping and losing a tide as they are sometimes obliged to do now, either when the Boats are large and heavy, or a strong wind against them ; at present the water is too deep to pole and the jungle too thick to track, but with Tow-paths of one mile or less they might go on to the next Canal, where the current would be either in their favour, or they could track through it and get a favourable current at the next Khal or Nullah.

" 33rd. The work proposed during the ensuing season, therefore, on the Sunderbund Canals and navigation, is making a tracking path along one Bank of the following Nullahs, viz :—
 From the Tarda Nullah to the West end of the Bhaminghatta Canal,.. .. 900 yards.
 Along the East Bank of the Sealda Khal to the Chytul Canal, ... 1,300 yards.
 Along the South Bank of the Hinshee Khal to the Bhawannypore Canal, .. 1,600 yards.

3,800 yards.

" 34th. The Tow-paths along the whole length of the Canals require to have the jungle cut, and the ground to be levelled in many places.

" 35th. The 3,800 yards of Tow-path might probably be done for 1,100 Rs. ; but it is entirely conjecture, as I have no data to go upon. The manner in which Mr. Prinsep recommended might be adopted, viz. by keeping a gang of 20 or 30 men constantly employed until they finished the work.

" 36th. The manner of making the Tow-paths proposed, would be to leave about 15 or 20 feet of the jungle near the Bank to preserve it, but to cut it down to 3 feet in height, and then to raise a Bund about 10 feet wide at base, and 18 inches high, by earth taken from the inside."

(True Copy.)

(Signed) R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 133. a.^(1.)

A.

Rough Plan of the proposed Cess-pools.

June 23rd, 1833.

The general idea of the Cess-pools may be formed from the following description :

The Cess-pool will be about 60 feet by 50 feet at bottom, and rivetted there by walls 2 feet high, the sides will be sloped (2 to 1), and covered with grass ; the level of the top of the rivetment Walls will be about 2 feet above the mean level of the Canal A. Wall B, will be built across the present Drain, and projecting into the Cess-pool 10 or 12 feet, to carry the current into the middle of the Pool.

The Cess-pool is supposed to contain one hour's water, during which time it is supposed that the mud will be deposited. From C to C is an opening back again into the Drain, with a grating as seen in section 3. The area of this grating will be so much larger than the Drain that the velocity of the water passing through it will be so much reduced, that only the lightest part of the mud held in solution will be carried into the Canal : and as the quantity of sediment held in solution bears a certain proportion to the velocity of the current, the Canal at 17 inches in a second will easily carry into the Lake the mud brought down by the Drains from the Cess-pool.

As far as my information goes, a Cess-pool of the size described, will hold more than all the sediment brought down by a rain of 4 inches in 24 hours in the largest of the Calcutta Drains. It would have to be cleared out every day while such rain continued, and as the Drains are in pairs, and there would be a Cess-pool to each, if a communication was made between the Drains under the Road, each of them alternately might be laid dry so as to dig the filth out as required.

No. 133. a.^(2.)

B.

Comparative Estimate of Dredging up the sediment from the Circular and other Canals by the Steam Dredger and by hand labour.

The Steam Dredging Boat is 24 feet wide, and draws 6 feet water, and has an engine of 14 horse power; it raises on an average in mud and sediment 75 tons per hour—burns 170 lbs. of coals per hour.

Description of the Boat.

The cost, independent of fuel and repairs, is as follows:—

Establishment, ...	Rs.	190
Engineer's Salary, ...	..	350
	—	540

And when Working—

Coals 170 lbs × 10 hours × 25 days = 600 maunds, @ 8 As.	..	300
Repairs, ...	..	150
Receiving Boats, ...	..	110
	—	560
	—	1,100

Work Done.

Tons. Hours. Days.

75 × 10 × 25 = 18,750 tons, @ 1,100 Rs.

equal to Rs. 5-14 per 100 tons.

Or, if the expence of Working only is considered, it will be—

Tons. Tons. Rs.

18,750 : 100 = 560 : 3 per 100 tons.

A Chouka of mud is equal to about 35 tons, and the average cost of excavating the Canal was at 1 Rs. 6½ As. per Chouka, or 4 Rs. per 100 tons.

The probable quantity of sediment to be excavated annually may be stated 45,000 tons :	Expence by hand labour.
45,000 tons @ 4 Rs. per 100 tons = ...	1,800
Making and dredging three Bunds @ 50 = ...	150
Pumping and Baling, ...	50

Yearly expence, ... Rs. .. 2,000

Dredging Boat.

45,000 tons @ 5-14 per ton, ...	2,643
45,000 tons @ 3 per 100 tons, ...	1,350

It will be borne in mind, that dredging to a certain extent must be resorted to, and a constant expenditure under this head allowed for.

The present expence of keeping up this Boat may be stated at 6,000 Rs. a year, which expenditure might be reduced to 5,300 by employing it on the Circular Canal, and if used in the other Canals it might cover its whole expenditure. Probable value of this Boat 40,000 Rs. and fitting it for the Canals from 500 Rs. to 3,000 may be necessary, according to the state of the machinery and stores.

J. THOMSON, Captain,
Superintendent Canals.

June 23rd, 1833.

No. 134. a.

No. 61.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO LIEUTENANT COLONEL R. TICKELL, C. B.,

*Superintending Engineer, Lower Provinces.**Calcutta : 10th July, 1833.*

SIR,

Sections of the Tides
in the Circular Ca-
nal forwarded.

I have the honor to forward a section of the Tides at high-water in the Circular Canal when the Gates were left open ; these three Tides are the mean of about 20 measured Tides, which agreed within 2 inches on the Guages.

Velocity of current
in the Canal with
the consequences.

2nd. The strongest current through the Locks was at about 4-5ths flood, and was 3 and 1-10ths miles per hour, or 53 inches in a second ; at which time the current under the Bridges was about 18 inches in a second and 14 or 15 in the Canal, except at the middle of the Balliaghatta Canal, which is much obstructed by Boats, and is very narrow. The current at this place was not measured, but appeared to be about 40 or 50 inches in the second ; it has injured the Bank not so much from the current as by the Boatmen driving stakes into it and pulling it down. The Magistrate has remedied this evil.

Proposed remedies
for these.

3rd. It appears from this trial, that a sufficient current cannot be got in the Circular Canal unless the Banks of the Balliaghatta Canal are injured, or the empty Boats removed out of the latter Canal, and the section in the middle and other narrow parts made equal to that of the Circular Canal. These latter alterations are recommended in my Report.

Effect of removing
the sunken Boats.

4th. The section of the highest Tide on the Salt Water Guage, was taken when all the obstructions of sunk Boats were removed from the Balliaghatta Canal : the effect is apparent.

I have, &c.,

(Signed) J. THOMSON, Captain,

(True Copy.)

Superintendent of Canals.

(Signed) R. TICKELL,

Superintending Engineer, Lower Provinces.

(No. 135 to No. 137 inclusive, omitted.)

No. 138.

No. 2202.

EXTRACT OF A LETTER FROM THE MILITARY BOARD,

TO THE RIGHT HONORABLE LORD W. C. BENTINCK, G.C.B.,

*Governor General in Council.**Fort William : 10th September, 1833.*

Dept. of Public Works.

“ We have the honor to submit copies of the Documents noted in the margin,

Letter No. 755, dated the 2nd July, from
the Superintending Engineer, Lower
Provinces.Ditto No. 44, dated the 18th June last,
from Capt. Thomson, and Appendices A.
B. C. D.Ditto No. 904, dated the 16th July, from
the Superintending Engineer, Lower
Provinces, and enclosure.Ditto No. 1245, dated the 19th ultimo,
from ditto and enclosure.

on the subject of the Circular and Moofussil Canals.

“ 2. The Chief Engineer and Lieut. Colonel Craigie consider this first Report by Captain Thomson on the Canals to be very creditable to him, and to indicate a mind of science and resource, as well as a judicious observation of the important works which have been committed to his charge,—we approve of the review taken by the Superintending Engineer of Captain Thomson's Report.

N.B. The

*Thomson Capt.
Capt. Canals*

and. The defective state of the DAMS adverted to in the 5th paragraph, demands our serious attention; for every possible precaution ought be adopted to lessen the enormous quantity of soil that appeared to be annually washed through them into the Canal, and which, unless the evil be effectually overcome, will, I fear, involve a very heavy annual expence, or

render the Circular Canal of little more use than as a mere receptacle or sewer to the Town of Calcutta. I have therefore directed Captain Thomson to prepare the requisite Plans and Levels, &c. and to submit an Estimate of the probable expence of executing the measures he now suggests, which appear to be extremely necessary, whatever other Plan may eventually be decided on for keeping open the navigation of the Circular Canals.

I have, &c.,

(Signed) R. TICKELL, *Lieut. Colonel,*
Superintending Engineer, Lower Provinces.

No. 146. a.

No. 89.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO LIEUTENANT COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta: 8th October, 1833.

SIR,

Although I am not yet prepared to make a definite proposition for preventing the mud and filth being brought by the Drains of Calcutta into the Circular Canal, yet I consider that the quantity brought down might be reduced to nearly one-half by the following alterations in the Drainage of the ground between the Circular Road and the Canal. This ground is under the charge of the Magistrate of the 24-Purgunnahs.

2nd. During some of the heaviest falls of rains in the months of July and August last, I visited the principal Drains leading into the Canal, particularly the Narculdangah Drain, which is most injurious, and to which my remarks shall principally refer. It has so happened this year that no shower of rain has fallen exceeding 22 inches in the 24 hours, and the Drains are capable of draining off about 4 inches in the 24 hours. The greatest current that I observed in the Narculdangah Drain was 3 feet 9 inches in a second, with a depth of 1 foot 6 inches and width of 6 feet, or about 9 square feet, with a mean velocity of about 1 foot 2 inches per second; or 10 cubic feet in a second. This is about one-third of what the Drain is capable of doing. It was further observed, that the greater part of the filth brought by the Drain in question was received from the Cross Drains to the East of the Circular Road, particularly the East Drains of this Road, and it has been a common practice to take up the mud in this Ditch, after heavy rain, so that it may be carried away by the current in the Drain, and save the expence of cleaning it out, but causing an expence of 6 times as much in cleaning out the Canal.

3rd. My proposal is, that the mouths of all the Cross Drains leading into the principal Drains in the district between the Canal and the Circular Road be built up to within 1 foot 6 inches, or 2 feet of the surface of the ground, or so high that the water in the Cross Drains shall not run in them with a greater current than 1 foot in a second. The anticipated consequences will be, that in a year or two they will be filled up to the height of the Dam across their mouths, and the current so much reduced that no filth will be brought down by them that cannot be removed by the current in the Canal.

4th. My attention to this simple plan was called by Mr. Prinsep, who has reported that he had partially closed up the mouth of one of the principal Drains leading into the Circular Canal, on the theory of making

the Drain itself act as a Cess-pool by reducing the velocity of the current through it. The experiment was successful in as far as the sediment was deposited in the Drain to the height of the Dam, and if this filth had been dug out as it accumulated, it would be all that was required. But the water-way left by the Dam was not intended to pass the water that falls during the rains, and the Dam of course removed previous to them.*

* Sic in original.
—J. M.

5th. Although the principal Drains are not under my charge, yet I take the liberty of remarking, that a considerable portion of them are not rivetted, Drains not all rivetted, recommended to be so. and the Banks are liable to fall, or be washed in, which is another cause of sediment so frequently remarked.

6th. In order to Estimate the expence likely to be incurred in carrying this scheme into effect, I would require Plans, Levels, and other measurements, which my Surveyor Mr. Turner will undertake, if the project meets your approbation.

I have, &c.,
(Signed) J. THOMSON,
Superintendent of Canals.

(True Copy.)

(Signed) R. TICKELL,
Superintending Engineer, Lower Provinces.

Resolution.—Agreed to acquaint the Superintending Enginecr, that the Board approve of Captain Thomson's proposal, and of the instructions he has given him on the subject.

(No. 147 and No. 148 omitted.)

No. 149.

No. 2823.

FROM THE SECRETARY MILITARY BOARD,

TO CAPTAIN JOHN THOMSON.

Fort William : 25th October, 1833.

SIR,

I am directed by the Military Board to request, that you will Report what was the effect on the Circular Canal of the admission of a current from the River on the 28th ultimo.

I am, &c.,
(Signed) G. YOUNG.

No. 150.

No. 105.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO CAPTAIN G. YOUNG,

Secretary to the Military Board.

SIR,

Calcutta : 12th November, 1833.

I have the honor, in reply to your Letter No. 2823, of the 25th ultimo, to report on the effect of the Circular Canal of the admission of the current from the River on the 27th September last, and also on the state of the Canal generally.

2. I sent with this Report a tracing of the section of the Circular Canal, in which the height of the water on the 27th September is marked, the usual height being at zero. The black line marking the bottom of the Canal is the mean depth derived from a number of soundings ending on the 1st of August, and when the Lock-gates having been shut the mud in the Canal began to accumulate. The red line marks the average of soundings taken between the 27th of September and the present time. From the sickness among my people who take the soundings, I had only one set previous to the 27th November, and that set having been taken by a different person, from those accustomed to do so, I could [not] derive any information from it.

3. In my report on the Canals, I stated the difficulties and uncertainty of soundings in the Circular Canal, this is very apparent in the accompanying sketch, and will account for my inability to give any satisfactory information, either of the quantity of sediment brought down by the Drains or the proportion which may have been removed by the current admitted on the 27th November.

4. The velocity of the water in passing through the Lock at the surface was 12 feet per second, and the mean velocity 10 feet 3 inches. The discharge therefore through it was 3,700 cubic feet in a second. The current under the Barrackpore Bridge was influenced by that through the Lock, but at the Manicktollah and Narkuldanga Bridges it was conjectured to be 5 feet in a second. In the Balliaghatta Canal the current appeared to be 6 feet per second, and there was about 1000 yards of length from 1 foot to 1½ foot of the South Bank cut away. I expected much greater damage to have been done, but 3 or 4 Boats having been sunk, a great many of the proprietors of the other Boats took the alarm and employed a number of men to track their Boats into the Entally Canal along the South Bank, which in a great manner preserved it. There were several places in the Circular [Canal] slightly injured in consequence of the strong wind that was blowing contrary to the current in some of the reaches. This was most apparent near the Ultadanga Bridge, where the Canal has passed through old Tanks, and has its Banks formed of loose earth. In consequence of one of the broken Gates laying across the Lock the current was thrown to the North side of the Basin, where the Dredging Boat was moored: these circumstances caused a strong eddy, which cut out the bed of the Canal to a depth of 12 or 14 feet. This injurious effect had been increased by a Bund on the South side, which could not in July last be removed by the Dredging Boat in consequence of the hard nature of the ground of which it was formed. The earth excavated by the above-mentioned cause has apparently been deposited along the bed of the Canal about 1½ foot deep, as far as the Dum-Dum Bridge.

5. I took soundings, as I before mentioned, on the morning of the 27th November, before the Gates were opened, and next succeeding morning, from which it appears that opposite the Manicktollah and Narkuldanga Drains the current deepened the water from 2 feet 9 inches to 5 feet 3 inches at one Bridge, and to 3 feet 9 inches at the other; 1-3rd of which earth, or 5,000 cubic feet from each Bridge, was probably removed into the Lake, and the remaining 2-3rds distributed over the bed of the Canal.

6. From the nearest calculation I can make, the average quantity of sediment deposited by each Drain into the Circular Canal is about 20 or 30,000 cubic feet, the Durrumtollah Drain has deposited, however, 70 or 80,000 cubic feet in the Entally Canal, but the fall of rain this year has been scarcely one-half of the usual quantity, and it is the principal cause of this deposit.

7. The Banks of the Entally Canal between the Coolya Bridge and the Circular Canal slid during the rains in three different places, which will partly account for the shallowness of that part of the Canal.

8. Although the sediment left by the Drains this season might be dredged out for 1,000 Rs. or 1,200 Rs. yet there are five or six Bunds on which there is only 4 feet 9 inches water, which are too hard to be removed

26,000 cubic feet from 7 Drains = 250 Chowkas, at 4 Rs. per 1,000.

by dredging, and can only be dug out by the Canal being laid dry: if the Canal is laid dry for this purpose the earth opposite the Drains may be removed for 400 Rs. or less. It was proposed by the Committee of Engineers, dated January 1832, to lay the Canal dry, and commence with a great number of men, upon the whole length of it, and thereby only close the navigation for 14 or 15 days—but as the Bunds nearest the River must be removed before the water can be run off so as to dig out the next one, they must be removed in detail, and the time occupied will be 6 or 7 weeks for the Circular Canal alone, and it may not be expedient to do any thing to the Balliaghatta and Entally Canals this year.

9. The loss of Revenue from the Circular Canal being closed from 1st December till the middle of January will be but trifling, compared with closing up the Balliaghatta Canal, or waiting a month later when the Boats going to the Upper Provinces may have commenced passing through the Lock.

10. The large quantity of sediment brought down by the Durrumtollah Drain, and the very favorable situation for a Cess-pool at the mouth of it, induces me again to recommend its construction. I will send a plan and estimate as soon as I can find time to take the requisite levels and measurements.

11. If the Canal is to be closed and dug out, I will require the authority to do so by the 1st of December. I will in the mean time commence on the removal of the Bunds between the Lock and the River as soon as the Tides will permit, charging the amount in my current expences, if the authority above-mentioned should not be granted.

The Estimated expence of laying the Circular Canal dry, and digging it to an uniform depth of 7 feet is 1,479 Rs., but as much will depend on the Tides and the dryness of the season, a contingency of 500 Rs. will have to be added to this, as Draining may be found necessary.

Estimate—mean length 10,500 feet.	
mean depth 1 foot 3 inches.	
mean breadth 33 feet.	
570 Choukas at 2-8 Sa. Rs. ..	1,425
A Bund, 20 + 7 + 50 = 7000 c.	
feet, or 9 Choukas at 2 = ..	18
Dredging ditto at 4 = ..	36

Contingency, ..	1,479
	521
	2,000

When the Circular Canal is again opened, and the season would permit, it might be found advisable to close the Entally Canal and dig it out in a like manner as far as the junction of the Circular Canal. This Canal was dug

out as far as the Coolya Bridge two seasons ago, but it is at the present moment quite dry for 100 yards, and may be expected to be entirely closed up in two seasons more.

Judging from the expence already incurred on this Canal, an annual expenditure of 2,500 Rs. may be expected in future, principally caused by the difficulty in the disposal of the earth that may be dug out of it. The earth brought into the Canal by the Durrumtollah Drain cannot be expected to be reduced in quantity, but it could be removed from a Cess-pool for about 250 Rs. a year, and as no ground is to be hired on which to deposit it (independent of the nuisance of such plan) it must be carried into the Salt Water Lake at a cost of 500 Rs., and if the plans already proposed for preventing the sliding and washing in of the Banks are adopted, the annual expenditure may be kept within 900 Rs.

No. 151.

No. 3252.

FROM THE SECRETARY MILITARY BOARD,

TO CAPTAIN J. THOMSON.

SIR,

The Military Board understand that the section of the Balliaghatta Canal is not equal to that of the Circular, and more particularly that the depth of the former is not equal to that of the latter.

See Prinsep's Survey.

2. If this be the case, it appears to the Board that the clearing away of Bunds in the Circular Canal and the removal of deposit in it, ought to be contemporaneous with the widening and deepening of the Balliaghatta Canal, or on the other hand, if the latter is not undertaken the former would be premature and ineffectual, except indeed as forming a deeper Cess-pool for the deposit brought down by the Drains.

3. The Board request, that you will state your opinion on these points with as little delay as possible.

No. 152.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO CAPTAIN G. YOUNG,

Secretary to the Military Board.

Calcutta: 22nd November, 1833.

SIR,

The mean section of the Balliaghatta Canal is about one-fourth less than that of the Circular Canal, but this difference is much increased by Boats. The sections may be stated as follows:—

The Circular Canal,	..	..	..	..	..	..	..	280	Sr. feet.
Balliaghatta Canal,	..	..	..	..	..	..	..	210	Sr. feet.
Ditto ditto reduced by Boats,	..	..	..	..	..	..	..	160	Sr. feet.

2nd. The consequence of this difference of section is, that as the Banks of the Balliaghatta Canal will be injured by a current exceeding 3 feet in a second, the current in the Circular Canal will be reduced to less than 2 feet.

3rd. By a better arrangement of the Tolls and other Regulations for these Canals, I anticipate that the Boats now lying in the Balliaghatta Canal will be equally distributed over the Circular Canal, and when this latter is dug out to a section not less than 350 square feet, the proportion between the two Canals will be about the same as before, or as 3 to 2.

4th. If the current was running from the narrow Canal into the wide one the latter would act as a Cess-pool, but when it runs from the greater into the less, the only disadvantage is, that the benefit of the greater current, viz., 3 feet in a second, is not to be had for the purpose of removing the filth brought down by the Drains. To remove this disadvantage by digging out the Balliaghatta Canal to an equal section with the Circular Canal, would cost 5 or 6,000 Rs., whether this is an equivalent I cannot at present give an opinion, until the Tides are permitted to run through the Canals for one season. Some of the Bunds too hard to be dredged, are not cut to a depth equal to that of the Balliaghatta Canal, and therefore obstruct the navigation. If the Canal is laid dry for the purpose of removing these, the additional expence of digging out 1 foot or 1½ foot more in depth than the Balliaghatta Canal will not be considered of any consequence, when the necessity of laying the Circular Canal dry next season may be thereby avoided, and in the intermediate time, circumstances may not require this expence on any future occasion. When the hard Bunds are removed and the side sediment from the Drains accumulates during the rains of 1834, the effect of the current admitted during the spring of 1835 would then decide what other means may be necessary for keeping open the navigation. I do not anticipate any at present, except in the Entally branch of the Canal.

(True Copies.)

G. YOUNG,

Secretary Military Board.

(No. 153 to No. 160 omitted.)

No. 160. a.

No. 126.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO LIEUTENANT COLONEL R. TICKELL, C. B.,

*Superintending Engineer, Lower Provinces.**Calcutta : 9th December, 1833.*

SIR,

With reference to the 7th paragraph of the Military Board's Letter, No. 2198, calling for Estimates of the expence of constructing the Embankment and for executing the Basins adverted to in the 19th and 20th paragraphs of my Report on the Canals, I have the honor to forward an Estimate for the Embankment, and to Report, that the effect of closing up the Nullahs and forming the Embankment, will be to cause a strong current into the Lake past Balliaghatta, which will, in a few months, make a Channel 9 or 10 feet deep. This Basin could not be made by Dredging, because the soil is too stiff, and it could not be excavated in $3\frac{1}{2}$ feet water, except at an expence of 15 or 20,000 Rupees.

2. The Basin and Docks now at Balliaghatta, which are the property of individuals, will hold 150 or 200 Boats; and all that is required, is that the Basin and the entrance be deepened to 6 feet in the dry weather, or about 7 on the guage, which will be effected by the plan proposed.

3. It is not intended that all the Nullahs connecting the South-west Lake to the Lake Channel, should be closed up, because the proposed opening at Balliaghatta would be insufficient for Draining the Lake of rain water that might fall; it is therefore proposed to close up the connecting Nullahs in succession until a current of 3 or 4 feet per second is got through the Channel at Balliaghatta. The current at present does not exceed 9 inches per second.

If the Lake is, at any future period, Drained, the proposed Tow-path will have to be raised $1\frac{1}{2}$ foot, at a very trifling expence, and no alteration whatever will probably be required to the proposed Basin and Docks.

(True Copy.)

(Signed) R. TICKELL, *Lieut.-Colonel,**Superintending Engineer, Lower Provinces.*

(True Copy.)

G. YOUNG,

Secretary Military Board.

No. 161.

No. 4676.

FROM THE MILITARY BOARD,

TO THE HONORABLE SIR C. T. METCALFE, BART.,

*Vice-President in Council.**Fort William : 14th February, 1834.*

Department of Publick Works.

HON'BLE SIR,

Submitting an Estimate by Capt. Thomson for prolonging the North Bank of the Balliaghatta Canal, &c. with Copy of a Letter from that Officer.

With reference to the 1st paragraph of our Letter, No 2202, of the 10th September last, we now beg to submit for the consideration of your Honor in Council, the under-mentioned Estimate, together with Copy of a Letter from Captain Thomson, (No. 126, of the 9th December last,) and to recommend that the proposed

expende be sanctioned. Estimate (No. 235, Book B of 1833-34, M. B. O.) by Captain J. Thomson, Superintendent of Canals, of the probable expence of prolonging the North Bank of the Balliaghatta Canal and Bunding several Nullahs, &c. in order to draw a stronger current into the Lower Lake past Balliaghatta, amounting to Sicca Rupees 3,400 : 0 : 0.

2. The rates of earthwork have been examined, and although high, may be considered admissible with advertence to the nature of the work, a great portion of which will be under water.

3. This work will probably afford some criterion as to the expence of the Bunding Work that will be required in Draining the Salt Water Lakes, and may be considered as a first step in that work.

4. Lieut.-Colonel Galloway does not recommend this Estimate, because, in the event of warping the Salt Water Lake, a measure at present in the contemplation of Government, the Bund and work here Estimated for, will not, in Lieut.-Colonel Galloway's opinion, be at all required; and for an explanation of this opinion he begs to refer to his Minute on the Draining, &c. of the Salt Water Lakes, submitted to Government with our Letter of the 7th instant.

5. The majority of the Board are disposed to rely on the recommendation of Colonel Tickell and Captain Thomson. The prolongation of the Circular Canal South-eastward, clear of the Lake, would render the work now proposed unnecessary. But that is a measure not likely to be undertaken with reference to its expence compared with its usefulness and urgency.

We have the honor to be,

Hon'ble Sir,

Your most obedient and humble Servants,

T. C. ANBUREY, *Colonel, Chief Engineer, Member Military Board.*

A. GALLOWAY, *Lieut.-Colonel, Member Military Board.*

D. McFARLAN, *Chief Magistrate, Member Military Board.*

(*No. 162 and No. 163 omitted.*)

No. 164. a.

No. 157.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta : 12th February, 1834.

SIR,

When I forwarded my Plan and Estimate of the Cess-pool in the Entally Canal, I intended that it should have been a pattern after which others might have been constructed, I therefore entered into all the reasons, explanations and details that I could suggest to meet every emergency : it appears I have thereby rendered my description confused and unintelligible.

2nd. Agreeably to the orders contained in the 2nd paragraph of your Letter No. 2846, I send a revised description of Plan and Estimate.

3rd. I have only to remark, that the height of the rivetment is determined by the highest rise of the water in the Canal, and not by the sill of the Drain, because if the

rivetment did not rise to the height of the highest rise of the water in the Canal, it would not retard the current and cause the sediment to be deposited.

4th. The length of the Cess-pool, viz. 300 feet, was adopted by me because on a depth of 6 feet it would hold one year's deposit, and cleaning it out annually, as originally intended, would certainly be preferable to cleaning it out every fortnight, the expence of pumping the water out in the first case, being balanced by the expence of Establishment in the other. The description of cleaning out every 15 days had reference to any other Cess-pool that may be constructed, and where the space was limited.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copy.)

(Signed) R. TICKELL, Colonel,
Superintending Engineer, Lower Provinces.

Estimate (No. 311, Book B. of 1833-4, Military Board Office, with a Plan) by Captain Thomson, Superintendent of Canals, of the probable expence of constructing a Cess-pool in the Entally Canal, amounting to Sa. Rs. 569-10-4.

Minute by Chief Engineer.—The original Plan does not accompany these papers, which I wish it did, because I am inclined to believe this Plan deviates in some measure, though not essentially, from the former, though not altering the principle of Captain Thomson's scheme, which I quite well understand; it matters little whether the water is let off instanter after a deposit has been made, or allowed to remain for the deposit of 6, 9 or 12 months or more, all will be regulated by the top or summit of the Dam, which however, the clearing out of the deposit [if] effected, must be of a height sufficient to *keep out spring-tides from the Canal below the Drain*. The Dam may have a sliding Sluice of boards which would allow of letting off the clear water in the Cess-pool at pleasure, and clearing away the sediment whenever it was required. I think Captain Thomson is clear enough in his Plan and detail, at least as far as my comprehension serves me to recommend the Estimate.

(Signed) THOMAS C. ANBUREY.

Minute by Lieut.-Col. Galloway.—Recommend. (Signed) A. GALLOWAY.

Minute by Chief Magistrate.—Recommend all but that part of the scheme which purposes to raise the rivetment higher than the sill of the Drain, that would have the effect of retaining back-water in the Drainage, and until the boards were taken out to let off the Cess-pool water, this retention of back-water would be objected to by the Magistrates in the Conservancy Department in the Town.

The highest rise mentioned by Captain Thomson, no art can protect us against—it must be allowed to advance up the Drain for a time and recede. The raising of a rivetment wall higher than the sill of the Drain would not mend that matter; it would however infallibly cause a back-water in the Drain on every occasion of heavy falls of rain which [would] last till the Sluice was opened, to raise it a little higher, and you will submerge that part of the Town, the Drainage of which depends upon the Dhurumtollah Drain, cutcherry* sediment enough no doubt; the top of the rivetment should therefore be 6 inches at least lower than the sill of the Drain.

* Sic in original.
—J. M.

(Signed) D. McFARLAN.

Resolution.—Agreed to address the following Letter.

No. 165.

No. 5369.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

With reference to your Letter No. 2998, of the 22nd ultimo, I am directed by the Military Board to say, that they have doubts as to that part of Captain Thomson's scheme which proposes to raise the rivetment higher than the sill of the Drain, which would have the effect of retaining back-water in the Drains until the boards were taken out to let off the Cess-pool water. This retention of water would be objected to by the Magistrates in the Conservancy Department of the Town.

2nd. The highest rise mentioned by Captain Thomson, no art can protect against—it must be allowed to advance up the Drain for a time, and recede—the raising of a rivetment wall higher than the sill of the Drain, would not mend that matter. It would however infallibly cause a back-water in the Drain on every occasion of heavy falls of rain which would last till the Sluice was opened.

3rd. It is true, as Captain Thomson says, that if the front Wall of the Cess-pool be not higher than the highest flow of the Tide, water will flow into it, but it is not true that this flow will be that of a current possessing strength sufficient to obstruct materially the deposit of sediment in the Cess-pool, it will be rather a swell than a current in the opinion of the Board, and as the Tide ebbs, there will be time for the subsiding of the matter contained in the reservoir.

4th. You will acquaint Captain T. with these remarks, and request him to submit his opinion on the subject, previous to the Board's decision with regard to the Estimate.

I have, &c.,

MILITARY BOARD OFFICE :

21st March, 1834.

(Signed) E. P. GOWAN,

Officiating Secretary, Military Board.

(No. 166 to No. 170 omitted.)

No. 171.

No. 197.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO CAPTAIN E. P. GOWAN,

*Officiating Secretary, Military Board.**Calcutta : 25th April, 1834.*

SIR,

I have the the honor to forward the following remarks on Mr. G. Prinsep's letter called for by the Military Board (Letter No. 5948, 22nd April).

2nd. In the 6th para. of the letter Mr. G. Prinsep states, "when the small experimental work was planned and laid out in 1828-29, and again when it was extended in 1829-30," the plan of the Chitpore Canal had been sanctioned, and the digging of it already begun, I was perfectly acquainted with the details of all the scheme, and especially with the plan

of the Locks. The scheme of the Canals and plan of the Locks may be briefly stated as follows : Major Schalch's matured plan was, that the head of the Circular Canal, leading out of the Hoogly River, was to be left entirely open, except some months in the rains, at which time a Log-Dam was to be put down at Barrackpore or Ooltadanga Bridge, Captain Prinsep's first scheme in 1826 was to make Sluice or Flood-Gates instead of the Log-Dam, so as to have the Canal open and navigable at all seasons of the year, except during the spring-tide of June, July, August and September, this scheme was further modified in 1829 by the proposed addition of two pair of Gates to each of the openings, thereby converting the Flood-Gates into navigable Locks. In proposing *these schemes*, the free admission of water from the Hoogly into the Canal, proposed by the projectors, was only limited by the height of the water, which would injure the Drainage of the City of Calcutta. As the Lock is at present constructed half the width of that of the original plan, and therefore admitting little more than half the quantity of water intended when the construction of the salt works were commenced upon—there cannot, I presume, be the slightest grounds of complaint against the management of the Chitpore Locks by me.

3rd. The second observation on which I am called upon to remark is contained in the same paragraph, and is "The fall of water at the Lock-Gates, a rapid like that of the old London Bridge," the Military Board are aware that a daily register is kept of the fall and velocity of current through the Lock at Chitpore, by a reference to which it appears, that the greatest fall which has occurred this year was two inches, and the most rapid current 4 miles an hour. The fall through the old London Bridge sometimes exceeded $4\frac{1}{2}$ feet, with a current of 12 or 15 miles an hour, the comparison between these two cases cannot be drawn with propriety—and [the] conclusion, that the Lock-Gates have been to "serve" as an *impediment* and *danger*, instead of a convenience, is equally inapplicable.

4th. The third subject of complaint which is contained in the 7th paragraph, is the injuries which the fisheries in the Lake may sustain by the admission of fresh water. No facts being adduced in support of this conjecture, the question rests on the natural history of fish, on which subject I do not consider myself competent to give an opinion, but one fact may be mentioned which bears on this enquiry, viz., that the Lakes are filled with fresh water during the rains,—the fisheries are worth about 4,000 Rupees a year.

5th. In the Postscript, 3 Boats, besides many others are stated to have been sunk, during the few days of mischief "created by me." I shall not consider this charge as personal, but to have been made in the hurry of writing, or in ignorance of my duties as Superintendent of these Canals. The removal of obstructions from the Balliaghatta Canal, which are the cause of the sinking of Boats in it, is not in my power, but is the duty of the Magistrate—every thing in my power has been done, notice has been given, and repeated Letters written to the Magistrate, but no attention whatever has been given to my requests. Having repeatedly brought this subject to the notice of the Military Board, no blame will, I hope, be attached to me for having exceeded or fallen short of the duties imposed on me.

Mr. G. Prinsep's Letter is herewith returned.

I have, &c.,
(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(No. 172 to No. 182 inclusive, omitted.)

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No. 183.

No. 416.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. P. GOWAN,

Officiating Secretary, Military Board.

Canals.

SIR,

Barrackpore: 30th May, 1834.

With reference to your Letter No. 251, of the 13th instant, relative to the Drains of the Road along the Circular Canal, I beg to enclose copies of two Letters from Captain J.

Thomson, Nos. 14 and 20, of the 20th and 28th instant, from which it will be seen, that it was never intended to lead the water from the Bank across the Roadway and then back again under the Road. The Drains A and B being continued as Surface Drains along the sides of the Road, until an opportunity offers for carrying off the water from the first to the westward, or into one of the long Town Drains.

With reference to Board's No. 251, of the 13th, relative to the Drains of the Road along the Circular Canal, forwards copies of Captain Thomson's Letters Nos. 14 and 20, of the 20th and 28th instant, by which it will be seen, that it was never intended to lead the water from the Bank across the Roadway and then back again under the Road, and states, that the mode adopted by that Officer for Draining the Banks is the best and simplest that could be followed.

2nd. I lately inspected the Circular Canal, accompanied by Captain Thomson, and conceive that the mode adopted by that Officer for Draining the Banks is the best and simplest that could be followed with reference to the unserviceable state of so many of the original Pucka Drains, and to the expence that would be incurred in repairing and enlarging them to a proper size.

3rd. Captain Thomson, in his Report of the Circular Canal last year, having stated as his opinion, that a pukka Road along the East Bank was not required, is now levelling that Bank with a slope from the crest across the whole breadth of 70 feet, as shown on the Sketch in the accompanying Letter No. 14, and suggested that should a breadth of 50 feet be considered sufficient for the Road and Tow-path, the remaining 20 feet be rented. The total area of ground that might thus be disposed of, and extending between the Boitakhanah and Dum-Dum Bridges, he calculates at 14,000 feet long and 20 feet broad, or equivalent to about 19 Beegahs, but as this probably could not be again resumed if required without considerable expence and difficulty, it should not be hastily relinquished for the profits it may hold out.

I have, &c.,

(Signed) R. TICKELL, Colonel,

Superintending Engineer, Lower Provinces.

No. 183. a.

No. 14.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 20th May, 1834.

In reply to your Letter No. 218, of the 16th instant, I forward to you a section of the Canal Banks as they are now being formed.

The Drain A, is continued as a Surface Drain along the side of the Road, until a favorable opening is found to carry the water off westward, or into the long Town Drain by means of a well with a grating. The Drain B, is formed on exactly the same principle,

but in all instances except one, it is carried into the Town Drains. The Drain C, on the east side of the Canals, is conducted in the same manner as the Drain A, but as there are no pukka Drains entering the Canal on that side, an opening eastward, to carry the water in that direction, is made through the Bank of earth whenever it may appear necessary or convenient:—to have made Mr. Prinsep's Drain sufficiently large to have been cleaned out, would have cost more than two Lacks of Rupees.

I have, &c.,
(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

No. 184.

No. 20.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta: 28th May, 1834.

SIR,

I have the honor to forward herewith, section of the Drains of the Road on the west Bank of the Circular Canal, taken from the measurement of two of them.

I estimated the expence of constructing these Drains sufficiently large to permit a man to go into and clean them, at six times their original cost, proposing that they should have two and a half times greater interior dimensions, or having six times more masonry in them.

2nd. On reference to Appendix D. to Mr. Prinsep's last Report on the Circular [Canals,] 48 Cross-Drains and one small Bridge, are stated to have cost about 7,000 Rupees. In my Letter No. 14, I mistook the number of cubic feet of masonry for the price: the above-mentioned Cross-Drains are on an average 350 feet apart. The state of these Drains are as follows: about half of them are in the same state as they were built, a number of them however became liable to be choaked generally at the upper grating, and the water either overflowed and cut into ravines the Canal Bank, or the Bank settled into large holes or slid according to circumstances: the Road also became softened and gave way in large hollows, which soon became impassable, some of the Drains became closed at the lower end and burst out through the slope of the Bank, in others the water passed down outside of the brickwork, permitting the Road and Bank to settle in holes: some of these evils might have been avoided by keeping some one to attend to the cleaning of the Drains, and repairing any injury that might occur, but they could not all be thus remedied.

3rd. I have not made use of any of those small Drains, and have effectually closed up those that have been injurious to the Banks, as I consider them wrong in principle and contrary to the usual practice.

I have, &c.,
(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copies.)

(Signed) R. TICKELL,
Superintending Engineer, Lower Provinces.

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No. 185.

No. 424.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. P. GOWAN,

Officiating Secretary, Military Board.

Barrackpore: 31st May, 1834.

Canals.

SIR,

Agreeably to the concluding paragraph of your Letter No. 109, of the 6th, I

With reference to the concluding paragraph of Board's No. 109, of the 6th, transmits Reports of the Committee, dated 23rd instant, on points connected with the improvement of the Canal Department, as adverted to in Capt. Young's, No. 2201, of 10th September last.

have now the honour to transmit, for the consideration of the Military Board, the accompanying Report of a Committee consisting of Captains W. R. Fitzgerald and J. Thomson, of Engineers, and a separate one from Mr. James Prinsep, both dated the 23rd instant, on points connected with the improvement of the Canal Department, as adverted

to in your predecessor's Letter No. 2201, of the 10th September last, to their joint address.

2nd. In further explanation of Captain Thomson's views, regarding the proposed Cess-pools, I beg to refer the Board to the 9th paragraph of his Report, No. 1, forwarded with my Letter No. 423, of this day's date.

3rd. The Chitpore Lock-Gates, having been allowed to remain open so short a period, no decided opinion can be formed at present, I fear, as to the effect of scouring the Circular Canal by admitting a current from the Hoogly, but I am of opinion with Mr. Prinsep, that the strength of current necessary to carry off the Drain deposit, could not fail to be injurious to the Banks of the Canal.

I have the honour to be,

Sir,

Your obedient Servant,

R. TICKELL, Colonel,

Superintending Engineer, Lower Provinces.

No. 185. a.

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 23rd May, 1834.

SIR,

In compliance with the orders received in your Letter No. 240, of the 17th instant, the undersigned have the honour to Report their opinion on certain points connected with the Circular and Balliaghutta Canals, specified in the Military Board's Letter, No. 2201, of the 10th September, 1833.

2. In reply to the first question the Committee are of opinion, that Cess-pools, at the end of the Calcutta Drains near the Circular Canal, would undoubtedly prevent, in a great measure, filth and sediment being carried by the Drains into the Canal; but the economy, expediency, or even practicability of constructing them, will depend entirely on the level of the water of the Town Drains, and that of the high and low-water in the Circular Canal, of

which levels the Committee have no defined knowledge. In reply to the first observation in the 2nd paragraph of the Military Board's Letter, the Committee are of opinion, that the bottom of the Cess-pool should be about the level of the low water in the Circular Canal, in order that it might be laid dry and dug out at any time during low-water. The expence of digging out the deposit from the Cess-pool would be about 1-7th of the expence of dredging an equal quantity from the bottom of the Circular Canal. The filth might be removed from the Cess-pool by either land or water carriage, according to circumstances. The opinion of the Committee in reply to the 4th paragraph on the best manner of preserving the Circular Canal, free from the sediment brought into it from the Town Drains, coincides with the opinion given in all former Reports on this subject, that a current of water be admitted from the River Hoogly through the Canal for this purpose, and if after a fair trial any further measures are necessary they may be then considered.

3. The Committee in reply to the second question contained in the first paragraph, are of opinion, that if in any part of the Canal the sliding of the Bank arises from the softened state of the lower part of the Bank on a level with the water, being unable to sustain the weight of the upper part, by the removal of that weight or pressure, leaving a berme or step on a level with the water, the sliding of the Bank will be prevented,—and they are further of opinion, that if the Banks are properly drained and cut to a slope, leaving a base not less than twice the higher, [*? height,*] that they will slide from the first mentioned cause only. With regard to the preservation of the Banks generally the Committee have to observe, that if after the Banks have been properly drained, the slope made not greater than the proportion above-mentioned, and the manner of fixing the Boats to the Banks properly regulated, any sliding which may take place should be remedied by making or leaving a step at the foot of the slope, or by encreasing the base of the slope in proportion to the height according to the situation and soil.

We have the honour to be,

Sir,

Your most obedient Servants,

W. R. FITZGERALD, *Captain, Engineers.*

J. THOMSON, *Superintendent, Engineers.*

No. 185. *a.*⁽¹⁾

As I differ in some respects from the opinion of my colleagues on the subjects referred for our consideration, I beg leave to record my sentiments separately.

1. Coss-pools of sufficient dimensions to create any deposition of the sediment of the Town Drains in its rapid passage during the rainy season to the Canal, I should think it impossible, or at any rate very difficult to construct, they must necessarily be very large and expensive reservoirs, in passing through which the current of each Drain should lose a considerable portion of its velocity. The deposit from each Drain annually being, say 50,000 cubic feet, would alone require a Chamber 50 × 100 × 10 feet. I however of course agree that Cess-pools would, if they existed, save the Canal from the present inconvenience—and I agree with Captains Fitzgerald and Thomson on the proper depth to be given to them.

2. I do not consider that a current from the Hoogly through the Canal would effectually prevent the Drain deposit. It would spread the evil throughout the line towards the Lake, and certainly carry off a portion, but unless the River water were admitted with such force as would be dangerous to the Canal Banks I hardly think it would have a scouring effect.

3. I have not observed any disposition in the Banks of the Circular Canal to slide, excepting at places where tanks had existed prior to the excavation of the Canal, which were filled in with the earth of excavation. The slope therefore of two-thirds (30 feet base to 20 feet height) would seem to be sufficient to preserve the Banks from sliding. I should not think therefore that there is any necessity for a berme or step as proposed by Captain Thomson. The Drainage of the Banks was provided for by water-courses leading generally through the Bank to the Canal, and I did not remark, while I was in charge, any difficulty on this score. A small establishment to clear the Drains and repair incipient damages is all that is requisite.

J. PRINSEP.

23rd May, 1834.

(No. 186 and No. 188 a. inclusive, omitted.)

No. 188. b.

No. 24.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 10th June, 1834.

With reference to your Letter No. 422, I have the honor to report as follows on the Balliaghatta Canal:—

2nd. The width of the space now occupied by the Balliaghatta Canal Banks and Roads is 150 feet; in a few places it is a few feet more, but in no place it is less. The effect of the current of water admitted from the Hooghly River, has had as yet no other effect, generally speaking, than to injure the south Bank; and no other effect can be anticipated until the manner of fastening the Boats in the Canal is properly regulated; and until I receive authority to do so, any report on the probable effects of a current through this Canal must rest on conjecture.

3rd. I shall state in a general manner the object I am desirous of attaining, leaving the details and cost to be ascertained when the work is approved of. The surface of the water of the Balliaghatta Canal is proposed to be 70 feet wide, (it generally exceeds this at present). The breadth of the Road on each side is proposed to be not less than 20 feet, with a Drain including slopes five feet wide; these will amount to $70 \times 25 \times 25 = 120$ feet, leaving 30 feet for the two slopes of the Banks. These slopes are proposed to be made with a base of 2 to 1 of height, which will give 8 feet as the greatest height of the Bank. The height of the Bank near the Salt Water Lake is at present about 3 feet 9 inches, and the rest of the Bank varies from that to 14 feet. It is therefore proposed to make the height of the Banks at the junction of the Circular Canal 8 feet, and to slope it gradually towards the Lake where it will be made 4 feet high, leaving the Roads at the east end 27 feet wide; as the width of the Canal to the west of the junction of the Circular Canal is of little importance, the height of the Bank at the Koolya Bridge will not be altered, but the slope will be increased in the proportion above-mentioned.

4th. It will be impracticable at once to make the Road of the breadth proposed, and the Bank with the slope of 2 to 1; because the Bank would have to be built of loose earth in some places, 15 feet into the water of the Canal: as it now is, this loose earth would probably be washed away in a few days; it is therefore intended to remove the earth that is superfluous to the proposed section, and not to attempt to add any new Bank or Slopes until

there is formed by the process of silting, a foundation on which to raise it, as has been the case on the north side of the Canal.

5th. I wish particularly to observe, that the cutting down and sloping of the Banks of this Canal is necessary for the preservation of them, and only connected with the digging out or deepening of the Canal, in as far as it is necessary, previous to commencing the latter work.

6th If it is intended that this work be done during the season 1834-35, to prevent disappointment, I should receive authority to remove a proportion of the Boats from the Canal and commence the work on the 1st of September next. I could then commence the digging out of the Canal, if [it] is ordered on the 15th November, the only season that the work could be done with economy. When the excavation of the Canal was completed the earth taken out could be carried into the Salt Water Lake, to form the Tow-paths there, at the only season they could be formed, viz. from the 1st February to the 15th March.

I have, &c ,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copies) R TICKELL,
Superintending Engineer, Lower Provinces.

(No. 189 and No. 190 inclusive, omitted.)

No. 191.

No 57

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO CAPTAIN E P GOWAN,
Secretary to the Military Board.

SIR

Calcutta : 18th July, 1834.

In reply to the Superintending Engineer's Letter No. 953, and with reference to the Military Board's Letter No 1272, I have the honor to forward 5 sections of the Balli-

* No 191 b Revised Estimate by the Superintendent of Canals, of the probable expence of excavating the Balliaghatta Canal from the junction of the Circular Canal to the Salt Water Lake to the same Section as the Circular Canal, viz 72 feet wide at Zero and 30 feet at bottom, with a depth of 7 feet, and the Banks above water with a slope of 2 to 1, amounting, after correction, to Sixca Rupees 6,800 14 (See Board's Proceedings, 6th May and 4th July last)

ghatta Canal, having the section proposed marked on them in red ink, accompanying them is a revised Estimate* of the expence.

2. In measuring the sections (sent herewith) inaccuracies in the plans and reports of the ground belonging to this Canal were detected. The original breadth of ground said to have been purchased for this Canal was 150 feet, marked by the dotted lines aa, aa, but it appears by a reference to the Field Books of the Survey to have varied from 155 to 170 feet, marked by the letters b, b b, b In consequence of this additional breadth of Bank, the necessity of cutting down the Banks to the extent recommended in my Letter No. 24, of the 10th June, is avoided, and a revised Estimate is sent accordingly.

I have the honor to be,

Sir,

Your most obedient Servant,
J THOMSON, Captain,
Superintendent of Canals.

(No. 192 to No. 210 inclusive, omitted.)

No. 211.

No. 2662

FROM THE MILITARY BOARD

TO THE HONORABLE SIR C. T. METCALFE, BART.,
Vice President in Council

Fort William 23rd September, 1834.

Department of Public Works
 HONORABLE SIR,

Recommending Captain Thomson's Bill
 for excavating the bed of the Circular Canal,
 with remarks.

With reference to the 4th paragraph of our Letter No. 3,479, dated the 3rd December 1833, in which we stated our having authorized the excavation of the bed of the Circular Canal, we have now the honor to submit for the sanction of your Honor in Council, the undermentioned Bill, and to recommend that it be passed

Bill (No. 65, Book H. of 1834-35, M. B. O.) by Captain J. Thomson, Superintendent of Canals, for expence incurred in cleaning and excavating the bed of the Circular Canal, amounting to Sicca Rupees 4,745 : 5 : 3.

2nd The amount authorized by us for this work and intimated to Government, was 1,975 Rupees, there is therefore an excess of Rupees 2,950 . 5 . 3 Captain Thomson has annexed to his Bill an explanation regarding this excess, which in so far as it shows the indispensable necessity for the extra work may be considered satisfactory. It was however the duty of Captain Thomson to have informed the Board, when he found that his Estimated outlay was likely to be so much exceeded. The rates however are moderate

3rd. The majority of the Board remark, that the amount of the above charge is satisfactory, in so far as that it was Estimated by Colonel Wood's Committee, that the annual expence of clearing out the deposit of the Calcutta Drains into the Circular Canal, by manual Dredging, would come up to the large sum of Rupees 15,000. It appears that the deposit of two years has been removed at the expence stated in the above Bill.

4th Lieutenant Colonel Galloway dissents entirely from the above paragraph. He remarks, that the work herein comprised embraces but a small portion of the deposit from the Calcutta Drains falling into the Circular Canal. The effects of the Calcutta Drains, as specified by Colonel Wood's Committee, were ascertained by actual soundings by Mr. James Prinsep. The Dhurrumtollah Drain alone is stated to have produced a deposit of 400,000 cubic feet per annum, and this Drain does not run into the Circular Canal, and consequently was not cleaned out by Captain Thomson on this occasion. Again, the scour by the admission of the water through the Lock, as expressly foretold by Colonel Wood's Committee, has had the effect (and it is all the effect it can have) of moving these shoals (of deposit) into "that portion of the Canals adjoining the Circular Canal." The deposit is therefore *moved in*, not *removed from*, the Canal by Captain Thomson's labor. He does not pretend that this has been effected. On the contrary, Captain Thomson, in his Annual Report dated the 10th May, particularly observes, that part of the Canal to the eastward of the Circular branch, has been "filled up this last year with filth from the Dhurrumtollah Drain. But this Drain is in addition to those which fall into the Circular Canal, and from it there is 400,000 cubic feet of silt to extract, what must be the amount of the whole, which at one point or other must be deposited? Captain Thomson's words are as follows: "The Ballinghata Canal is nearly in the same state it was in last year."

"The numerous obstructions then reported *were removed, but have again accumulated*," "about 300 yards of the west end of the Canal is filled up by silt from the Dhurrumtollah Drain." "The great width of the Canal at the east end, which by reducing the strength of the current, causes a silting up, perceptible since last year. This deposit has taken place at the sides of the Canal, the centre has probably deepened. I cannot give the precise depth, as some one has removed the Gauge." It would be strange indeed if Colonel Wood, Major Irvine, Captain Forbes, and Mr. James Prinsep, should have reported an accumulation of deposit to the extent of 883,000 cubic feet, besides that the Dhurrumtollah Drain requiring an annual outlay of 15,000 Rupees to clear it, and yet that the said accumulation, not for one, but for two years, besides original soil, should have been all extracted by Captain Thomson for 4,745 Rupees, and Captain Thomson himself not to know this or decline mentioning it.

5th. The majority of the Board beg leave to refer to Captain Thomson's Letter No. 102, dated the 15th instant, and observe that they think it more reasonable to correct an Estimate by the results of actual experiment, than to invert these operations as Colonel Galloway has done. It appears that the accumulation of mud in the Circular Canal has been at the rate of 382,050 cubic feet per annum, which may be removed at an expence of Rupees 2,350. The deposit from the Dhurrumtollah Drain into the Balliaghatta Canal, estimated by Mr. J. Prinsep at 400,000 cubic feet per annum, is not included in the present Bill; *neither was it included* in Colonel Wood's Committee's Estimate of 883,000 cubic feet, and Rupees 15,000, which referred to the Circular Canal only.

6th. The majority of the Board further remark, that it is only necessary to read Captain Thomson's 10th paragraph to see that it is the *western* end of the Balliaghatta Canal, which Captain Thomson says has filled up, on which the Circular Canal current could have had a very slight effect. In regard to the eastern end through which the Circular Canal current did flow, Captain Thomson says, "the centre has probably deepened," and "a perceptible silting up since last year" has taken place "at the *sides*," owing "to the great width of the Canal" at that end.

7th. That much of the Circular Canal deposit could have been carried into and left in the Balliaghatta Canal is wholly improbable: the bed of the Circular Canal was lower than that of the Balliaghatta, and was moreover intersected by Bunds; and lastly, the Balliaghatta or Eastern Entally Canal being narrower than the Circular Canal, must have had a stronger current, the effect of which would be to carry the silt into the Lake Channel, or still deeper tideways beyond. The injury to the Barrackpore Bridge has not yet been shown to arise from currents.

8th. Lieutenant Colonel Galloway observes on the above paragraph, that the omission of 400,000 feet of deposit by the Dhurrumtollah Drain would not diminish, but increase the cost; and that this fact, which is known, would render the operations of Captain Thomson not more probable but still the more marvellous. The moving of silt from one place to another however, is not extracting it, and therefore the operations of Captain Thomson, in cleaning out one particular spot at a small rate, no more show the cost of keeping clear this line of Canal from the deposit of the Calcutta Drains than the amount of any given Bill by Captain Thomson would show the cost of work executed by another. Lieutenant Colonel Galloway knows that the strong current admitted into the Circular Canal has moved the mud therein deposited by the Drains, but the consequence of this has been that the Banks of the Canal and the Bridges have been injured, and it has been thus demonstrated, that no such currents can again be admitted; and consequently, that no such clearing can again be produced—and he leaves it to be judged whether it is not paying too much for clearing the Circular Canal to do so at the risk of such demolition. Lieutenant Colonel Galloway refers to Captain Thomson's Report on the Barrackpore Bridge, the masonry

abutments under which, for Towing-paths, have sunk from the current having carried away to some depth the foundation soil between the Piers.

9th. Lieutenant Colonel Galloway remarks, that he has inserted the quotations from Captain Thomson's Report, and he believes they will prove beyond dispute, that part of this line of Canals was silted up with silt, which could have come from no other source than the Calcutta Drains, which nevertheless, the majority of this Board maintain, "was (and that for two years) removed by Captain Thomson, at the expence stated in this Bill."

10th. It is added, that "no injury to the Bridges has yet been experienced." It is sufficient to refer to Captain Thomson's Report on the Barrackpore Bridge to show that injury has been sustained.

We have the honor to be,

Hon'ble Sir,

Your most obedient Servants,

A. GALLOWAY, Lieut.-Colonel, Member Military Board.

D. McFARLAN, Chief Magistrate, Member Military Board.

G. YOUNG, Capt., Officiating Member Military Board.

(No. 212 omitted.)

No. 212. a.

*Extract—Letter from J. Prinsep, Esq., dated 15th March 1834, to
Superintending Engineer, Lower Provinces.*

Lock-Gates.

15. In my former Reports I stated, that the Gates would be swung by the 1st March : they were not, however, suspended until the following month, and the coppering of the last pair of Gates was not completed at the time of the storm in May. By caulking the outer pair of Gates, however, (as reported in my Letter of the — May 1833,) an easy means was obtained of laying the Lock Chamber dry, and finishing the work, so that the whole was ready by 20th June. The outer River Bund was then cut away, and I passed through the Lock passage for the first time on the 21st June.

16. The Gates continued in use for three months, and were found to work well in every respect. They were left open for a few tides during the 26th and 27th of July, without any ill consequence. During the height of the rains, when the low-water of the River was higher than the ordinary level of the Canal, the River Gates were necessarily always kept closed, but Boats were locked through without impediment or difficulty.

17. On the 28th September, during an experiment to ascertain the effects of allowing the River water to run freely through the Canal for a whole spring-tide, an accident, or rather inadvertence in the Overseer, caused the fracture of the inner pair of large Gates, as reported in my Letter of the 8th October. The removal of the broken Gates kept the Lock passage closed entirely for only three days; after which the daily transit of Boats, by means of the small Gates, was uninterrupted until the end of November, when the large Gates were once more placed in an efficient state. I should remark, that the broken Gates were removed, repaired, and re-placed, without taking the water out of the Chamber. The expence incurred by their accident has been kept separate in the accounts, and will be seen to amount to Rs. 1,200 : 9 : 84.

18. When the excavations were going on in front of the Lock towards the River, it occurred to me as very advisable to secure the foundation of the Lock masonry by buttresses

and a sunken face-wall, in a curved direction across the Canal, 25 feet in advance of the foundations of the Lock itself, so as to occupy the place of, and save the necessity of driving piles for their protection. This support to the River front was rendered more complete by terracing the space between the floor of the Chamber, the Steps, and the sunken wall, (as will be seen in the accompanying plan and elevation,) so as to allow the water to run freely over it, without any cascading or cutting action. The good effect of this has been manifest, and I could recommend a similar protection to the curved walls on the Canal side, should it be contemplated to allow the River water free ingress even occasionally: for (as reported on the 8th October, 1833) the force of one day's strong current cut away the bed of the Canal to a depth of 3 feet close to the masonry, and excavated a hole 8 feet in depth below the bed, at a short distance further on the Bank of the Canal. As long as the passage is only used for Locking Boats through, there is no necessity for any such measure.

19. The number of Boats capable of passing the Lock in a day, assuming that three on an average enter the Chamber together, and that ten minutes are consumed in their passage, may be estimated at upwards of 200. The register of six months appended to the present Report shows the average to have been nearly 50 daily. The Gates were never worked during the night. It must not be supposed that more Boats would pass if the passage were left entirely open: on the contrary, experience has shown that, on account of the velocity of current through the contracted Channel, few Boats venture to pass, even a short time after the turn of tide either way; and from the inequality in the hours of the tide in the River and in the Canal, added to the circumstance of the mean level of the Canal being midway, between high and low-water of the River, during the greater part of the year it happens that the slack water in the Lock Chamber is only of momentary duration, and the turn of the current very sudden and rapid. This requires some care in the manœuvring of the double system of Gates; but no inconvenience has hitherto been felt therefrom: the establishment of 12 Classees and 3 Divers, recommended in my letter to your address of the 12th August, 1833, being found ample under the superintendence of Mr. Bedford, the European Overseer, to work and look after them.

20. The Estimate I made of the probable velocity of stream and slope of surface under different conditions of the Canal and River, (see my Letter on the 6th June, 1831) has proved faulty in some respects. I assumed a constant height of reservoir and a continual flow of water; and then calculated by the usual formula what would be the velocity, supply, and slope, in the Canal and in the Lock passage respectively; such a state of things, however, does not occur, since the rise of the River continues while the stream is flowing: and before a sufficient supply of water has entered the Canal to produce a regimen, or equilibrated condition for any given height of the feeding reservoir, a new condition ensues, and the fall through the contracted passage is much greater than was contemplated: thus, with a difference of level between the River and the Lake of one and a quarter feet, I calculated that there would be a fall of 13 inches through the Lock, and a velocity of four and a half miles per hour, whereas in the experiment of the 27th September, the difference of level out and inside the Lock near the steps, was six feet, and in the passage alone 40 inches, while the velocity was estimated by the Overseer at $7\frac{1}{2}$ miles per hour.

21. Of the details of the construction of the Lock, I have little to add to what was stated in my former Report.

22. The masonry was bound together by a stone coping; each stone firmly united to the next with iron cramps: and the curved walls towards the River having shown symptoms of weakness, when the earth was filled in behind them, were further secured with an iron band bolted round them at the half height of the wall, and put on hot, so as to bind firmly as it cooled. It was thought at first that planking round the Wing Walls as well as in the Chamber would be necessary to secure the masonry from injury by the shocks and contact

of Boats, but experience has shown, that little damage need be anticipated on this score, and any such planking would be speedily destroyed by the boring-worm unless covered with copper. This has been the case already with the wooden planks and wedges bolted down on the stone sills of the floor against which the Gates close; but the latter can be re-placed without much difficulty when found to be unserviceable.

23. The Gates themselves were coppered all over, with the exception of part of the back of the inner large Gates, to protect them from the worm. It has been satisfactory to find that the copper of the rounded post wears much less than I expected by friction against the stone groove, although the Gates fit very closely against the stone when the pressure of water is considerable.

24. It was found unnecessary to apply rollers to the foot of the Gates to relieve the collars in opening and shutting them: the small Gates were nearly buoyed up in the water, and the large ones were perfectly balanced in deep water by their lever beams. The chain windlasses and levers were sufficient for manœuvring these Gates; but some little inconvenience was experienced in closing the small Gates from the impossibility of applying levers. I had at first intended to fix iron bars connected with the chain and windlass, so as to have a pushing as well as a pulling action, and thus serve to shut them: the oblique counterforts seen in the plan of the masonry, were intended to support the Tunnels in which these bars were to work, but I was induced to give up the design because of the difficulty of supporting such a length of bar, and of getting at the Tunnel to repair it in case of any thing getting clogged, or out of order in the apparatus; while any impediment might cause serious injury during the rapid change of current. I therefore determined on having every thing of the simplest construction, and all in sight and within reach: and I fitted on cross ropes and tackle to pull the small Gates open from the opposite sides of the Lock. The only inconvenience of this system was, that the ropes remained hanging slack across the Chamber while the Boats were passing. This however was rather an advantage to small Boats, as they were enabled to pull themselves through by the ropes; while the latter were unshipped in a moment, if necessary, for larger Craft or Boats with high masts.* The wear and tear of

Captain Thomson has since successfully applied the chain and rod movement to both pair of small Gates.—J. P. tackle will not, I conceive, be so expensive as any apparatus of a more complicated nature.

25. The manipulation of the iron Sluce Shutters, by means of a screw and nut, was found to be simple and easy, and the counterbalance weight to be unnecessary. The four-handled levers to work them are too near the ground, and may be advantageously raised so as to be worked by the hand without stooping.

26. I have terraced over the whole of the artificial earth included within the Wing Walls of the Lock from stairs to stairs, so as to prevent the rain water from penetrating to the back of the masonry. This point should be attended to, and in case of the ground subsiding at all below the level of the stone coping it should be filled up at once, and re-terraced until the earth has required sufficient solidity to resist the action of water settling on its surface.

27. Of the Bridge over the Lock erected by Captain Fitzgerald and Captain Thomson, I need say nothing more than that it stands upon foundations altogether distinct from the Lock, and may therefore be retained, if at any time it should be deemed advisable, to throw open the Canal in the style of Tolley's Nala. The total expenditure upon the Lock-Gates, including 1,200 Rs. for the damage done in September, has been in 1832-33, Rs. 39,702 : 8 : 9½, or, with last year's Bill, Rs. 61,098 : 7 : 11, being about two-thirds of the amount estimated for a double Lock.

29. I shall offer no comments upon the success or utility of the work, nor on the schemes connected with the Eastern Canals, which I understand to be now in contemplation. The department is now in the hands of an Officer whose scientific knowledge and experience are eminently adapted to do justice to the grand objects contemplated by the Right Hon'ble

the Governor General, in regard to the Salt Water Lake and Sunderbund navigation, and it will more properly devolve upon that Officer, as my successor, to Report upon the state of the Entallee Canal, and the works necessary to place the navigation between the Lake and the River in an efficient state. The first step (namely, the removal of all the Bunds, and the Drain-deposit in the Circular Canal,) has already been effected under his superintendence.

No. 212. a.⁽¹⁾

List of Boats Passed by Circular Canal.

Month.	Date.	Number of Boats.	Month.	Date.	Number of Boats.	Month.	Date.	Number of Boats.	Month.	Date.	Number of Boats.	Month.	Date.	Number of Boats.
1833.			1833.			1833.			1833.			1833.		
July	1	12	Aug.	1	45	Sept.	1	67	Oct.	1	26	Nov.	1	27
"	2	10	"	2	54	"	2	53	"	2	27	"	2	30
"	3	17	"	3	62	"	3	62	"	3	17	"	3	35
"	4	15	"	4	54	"	4	55	"	4	47	"	4	45
"	5	14	"	5	30	"	5	49	"	5	52	"	5	50
"	6	18	"	6	50	"	6	61	"	6	75	"	6	27
"	7	15	"	7	37	"	7	40	"	7	48	"	7	52
"	8	19	"	8	27	"	8	45	"	8	50	"	8	65
"	9	17	"	9	52	"	9	50	"	9	50	"	9	70
"	10	12	"	10	50	"	10	35	"	10	51	"	10	71
"	11	19	"	11	22	"	11	55	"	11	72	"	11	49
"	12	22	"	12	41	"	12	33	"	12	65	"	12	54
"	13	15	"	13	75	"	13	41	"	13	28	"	13	19
"	14	18	"	14	45	"	14	55	"	14	50	"	14	55
"	15	24	"	15	37	"	15	62	"	15	22	"	15	45
"	16	"	"	16	16	"	16	52	"	16	24	"	16	37
"	17	45	"	17	15	"	17	25	"	17	50	"	17	38
"	18	36	"	18	38	"	18	49	"	18	35	"	18	26
"	19	32	"	19	43	"	19	40	"	19	47	"	19	72
"	20	28	"	20	53	"	20	60	"	20	28	"	20	92
"	21	24	"	21	41	"	21	35	"	21	52	"	21	56
"	22	30	"	22	45	"	22	36	"	22	28	"	22	75
"	23	25	"	23	57	"	23	48	"	23	27	"	23	48
"	24	26	"	24	43	"	24	57	"	24	34	"	24	92
"	25	18	"	25	37	"	25	79	"	25	53	"	25	53
"	26	20	"	26	45	"	26	33	"	26	48	"	26	40
"	27	72	"	27	47	"	27	20	"	27	46	"	27	38
"	28	26	"	28	53	"	28	"	"	28	26	"	28	35
"	29	30	"	29	47	"	29	"	"	29	35	"	29	45
"	30	34	"	30	41	"	30	"	"	30	38	"	30	"
"	31	40	"	31	45	"	"	"	"	31	36	"	"	"
..	.	733	.	.	1347	..	..	1297	..	..	1287	..	.	1441
Abstract.														
July, ... 733														
Aug. ... 1347														
Sept. ... 1297														
Oct. ... 1287														
Nov. ... 1441														
Dec. ... 512														
Total Bts. 6617														

Calcutta: 8th April, 1834.

J. PRINSEP,
Late Superintendent of Canals.

No. 212. a.⁽²⁾

Extract from Lock Register kept by Mr. J. Bedford.

Month.	Date.	Morning or Evening.	Hour.		Moon's Age.	High or Low-water.	Lock Guages 100 feet apart.				River Gates.	Canal Gates.	Time of water passing 100 feet.	Velocity of current per hour.			
							River side.		Canal side.								
1833.			h.	m.			ft.	in.	ft.	in.			2ds.	m.	f.	ft.	
July.	26	Morning.	10	34	9	H. W.	12	10	12	8	Open.	Open.	18	3	1	160	Slope 2 inches.
"	...	Evening.	6	14	...	L. W.	6	6	6	6½	Ditto.	Ditto.	34	2	0	25	Ditto ½ ditto.
"	27	Morning.	11	24	10	H. W.	12	10	12	8	Ditto.	Ditto.	18	3	1	160	Ditto 2 ditto.
Sept.	27	Evening.	1	20	...	H. W.	15	10	12	6	Ditto.	Ditto.	9	7	0	3040	{ (Gates carried away) slope 40 inches.
Nov.	26	Ditto.	1	30	...	H. W.	11	0	11	0	Ditto.	Ditto.	34	2	0	25	Ditto 0?
"	27	Ditto.	2	0	...	H. W.	11	5	11	5	Ditto.	Ditto.	34	2	0	25	Ditto ditto.
"	28	Ditto.	2	30	...	H. W.	12	0	12	0	Ditto.	Ditto.	34	2	0	25	Ditto ditto.
"	29	Ditto.	2	40	...	H. W.	2	9	7	4	Ditto.	Ditto.	34	2	0	25	{ Mistake in this entry.
Dec.	4	Ditto.	3	20	...	L. W.	3	5	3	5	Ditto.	Ditto.	34	2	0	25	{ Slope not perceptible in 100 feet by the gauge.
"	5	Morning.	9	15	24	H. W.	9	1	9	1	Ditto.	Ditto.	36	1	0	2720	
"	...	Evening.	4	15	...	L. W.	3	5	3	5	Ditto.	Ditto.	34	2	0	25	
"	6	Morning.	10	30	25	H. W.	9	2	9	2	Ditto.	Ditto.	36	1	0	4720	
"	...	Evening.	6	0	...	L. W.	3	5	3	5	Ditto.	Ditto.	36	1	0	4720	
"	7	Morning.	10	0	26	H. W.	8	9	8	9	Ditto.	Ditto.	40	1	0	3720	
"	19	Evening.	3	30	...	L. W.	2	7	2	7	Ditto.	Ditto.	50	1	0	1920	

CALCUTTA:
8th April, 1834.

J. PRINSEP,
Late Superintendent Canals.

(No. 213 to No. 215 inclusive, omitted.)

No. 215. a.

No. 1.

EXTRACT OF A LETTER FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

To COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

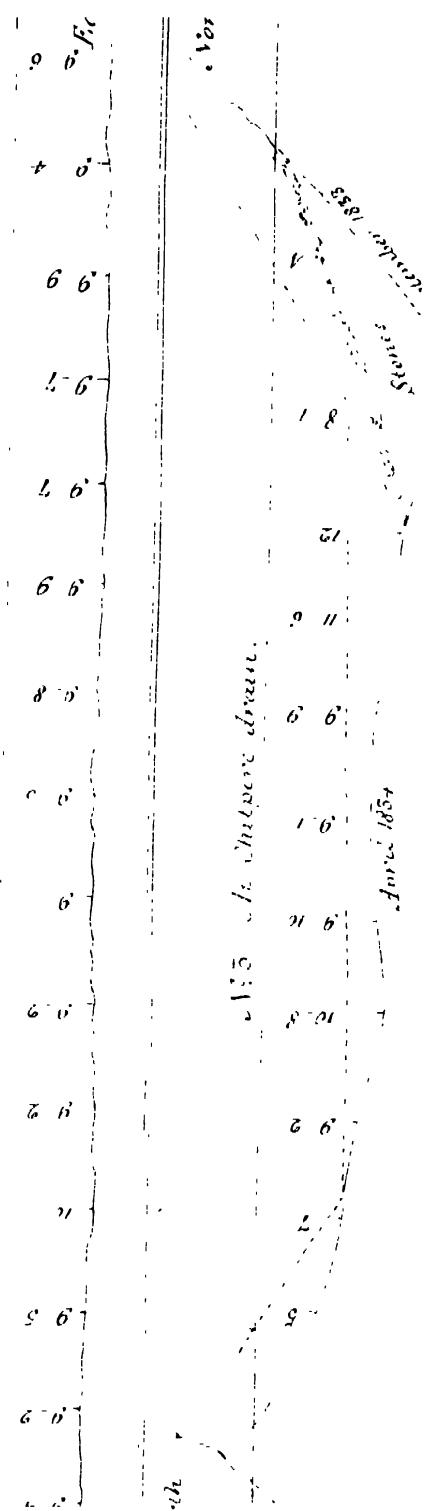
Calcutta: 10th May, 1834.

" The line of Canals forming the navigation between the Hoogly and Ishamuttee Rivers being completed, an annual Report of progress may be deemed superfluous: in this Report, therefore, I shall confine my remarks to the present state of the works, and to the best means of preserving and improving them.

" 2. Since I received charge of the Chitpore Locks in October last year, the Log-Dams were put in at each end, and the water between them pumped out. It required three days to put down one Log-Dam: as the Dam is required in cases of emergency, it would be desirable to be able to put it in its place in three or four hours, which might be done with a

the Canals Scale 20 feet to 1 Inch.
 the Chilpore Lock along the centre of the Canal.

Level of Level



one way in which this matter (of so much interest to me) could be arranged, and I hope to be pardoned for mentioning it. If the Military Board or Board of Conservancy, would draw up short instructions or directions for the management of the Drains beyond the Town Boundary, the Magistrate would no doubt carry them into effect, his Overseer Mr. Dyson, being an intelligent and active man; the directions above-mentioned might receive the sanction of Government, if considered necessary. As the case now stands, the Drains are in the same state as last year, and the same consequences will necessarily follow; and, as it may not be convenient to stop the navigation of the Canal next January, for the purpose of digging out the sediment brought in by the Drains, I have to represent the necessity of having a Dredging Boat ready to deepen the shallows where most needful.

" 9. In digging out the Circular Canal, I did not observe any light-coloured sandy sediment, such as might have been expected to have been deposited from the waters of the Hoogly River. The mud in the bottom of the Canal was, from its appearance, derived from the Banks which had slid, or been washed in by the rain before they had consolidated or become covered with vegetation. Two-thirds of the mud opposite the mouths of the Drains consisted of mould, arising from the sides and bottoms of the Drains, one-fourth was composed of very *soluble* black mud-formed vegetable and animal decomposition. The quantity of *soorkee* washed from the Roads into the Drains, and from thence into the Canal, was much less than I expected: it was scarcely perceptible. The causes of the deposition of sediment from these Drains are so varied, that a perfect remedy cannot be proposed to meet every circumstance; but I am still more strongly of opinion than I was last year, that Cess-pools offer the greatest advantages. I am supported in this opinion by observing, that Mr. Kyd, in his original proposal for the formation of the Circular Canal, considered Cess-pools at the termination of each Town Drain as not only essentially necessary for keeping the Canal navigable, but as a source of profit by disposal of the manure collected in them. No estimate or efficient plan for Cess-pools, however, can be formed until the opposing interests and different opinions, of what ought to be the proper slopes and levels of the Drains, are adjusted. It is no doubt the interest of the Conservancy Department to have as great a slope for the Town Drains as possible, as the increased current caused thereby will sweep away the filth and save them the expence of removing it. This saving to the Conservancy Department is a sixfold expence to the Canal Department, and of course to Government, who pay for both; because the same current that brings the filth from the City of Calcutta, brings at the same time three times as much soil and mud from the bottoms and sides of the Drains. The whole of which has to be dredged or dug from under 7 feet of water; without entering into any detail or calculation of what the slope of the Drains ought to be, so as to allow of the cheapest removal of the filth from the City of Calcutta, the Board of Conservancy would perhaps have no objection to have the slope reduced to what it was before the excavation of the Circular Canal, or to reduce it to 3 feet 9 inches per mile, which experience has shown to be amply sufficient. The slope which theory points out as the best, is 2 feet 6 inches per mile.

" 10. The Balliaghatta Canal is nearly in the same state as it was last year. The numerous obstructions then reported were removed, but have again accumulated. I have to report the following changes: about 300 yards of the West end of the Canal is filled up by filth from the Dhurumtollah Drain; about 600 yards of the South Banks has fallen in, to a greater or less extent; Section No. 5 shows the usual appearance of it at present; Section No. 6 is that of 200 yards of the worst place; about 800 yards of the North Bank at the East end has, under the orders of the Magistrate, been cut very steep and injured, with a mistaken intention of improving the Road; the South Bank has also been cut by a private individual in a slighter degree. These injuries can be repaired at a small expence, and are only mentioned as increasing an evil which ought to be remedied; viz., the great width of the Canal

at East end, which, by reducing the strength of current, causes a silting up perceptible since last year; this deposit has taken place at the sides of the Canal, the centre has probably deepened. I cannot give the precise depth, as some one has removed my Tide Gauge opposite Mr. Prinsep's Salt Works, to which I referred my levels. Three other Tide Gauges have been removed from various places, by which the trouble and expence of taking a series of soundings for months have been lost, and I cannot resume this work again until I can devise some permanent mark as a standard to which I can refer the levels. The deepening of the mouth of the Balliaghatta Canal may be attributed to several causes—the persevering removal of sunk Boats from the head of the Lake Channel, the admission of water from the Hoogly by the Chitpore Locks, during 30 days of the years 1833-34, but more particularly the unprecedented low tides in the Lake Channel in November, December, and part of January last. *The rise* of the tide at Balliaghatta has been reported, and is generally believed to be about 10 inches; observation, however shows, that in the months above-mentioned, the rise and fall is 3 feet 3 inches spring-tides, and 1 foot 9 inches neap-tides. The low-water in the Lake Channel being 3 feet, 4 feet, and 5 feet below that in the Canal, causes a strong scour at the mouth of the latter, but with only a partial effect; as at that time, the water in the Canal was only 8 inches deep and 20 feet wide. If the Chitpore Lock had been available at that season, great benefit would have arisen by the admission of the River water.*

* This is an important fact, with reference to the Drainage of Calcutta.—J. M.

“ 11. The navigation from the Hoogly through the Circular Canal to the Sunderbunds, being entirely independent of the Sunderbund line of Canals, I shall take the liberty of bringing to your notice such parts of the *original scheme as have not been carried into effect*, and the alterations which have been proposed from time to time, which still appear necessary to the completion of the design.

“ 12. Embankments or Tow-paths on both sides of the Lake Channel formed part of the original scheme for this navigation; they were sanctioned by Government, and partly executed in 1825 by Major Schalch, the death of that Officer and the comparative failure of the attempt to dredge the Lake Channel, from which source the earth for the Embankment was to be procured, appear to be the reason that this work was not carried on to completion. The original purpose of the Embankments was to confine the water to the Channel, but from the two years' Dredging, or some other cause, the Channel has so much improved since 1825 as not to require Embankments for the above-mentioned purpose, as a current runs in a SE. direction nearly twice as long as in NW.; a tracking path on one side is requisite for the import trade during a part of the year—and from the strong Southerly winds during another part of the year, a tracking path is required for the export traffic—and if there is to be only one path, experience shows that it must be on the South-west side, in consequence of the strong Southerly winds. In connection with these Tow-paths is the proposal which has met with the approval of the Military Board, but the Estimate for which has not yet been sanctioned, viz. to convert the NE. division of the Lake into a reservoir to scour out the head of the Lake Channel, and consequently the mouth of the Balliaghatta Canal, and to deepen the entrance into the Docks at Balliaghatta. This latter work has been estimated at 800 Rupees. The Tow-path on the SW. Bank of the Channel, 8,500 yards in length, may cost about 3,000 Rupees, with the Bank two feet six inches high, as first proposed; but, as it is intended that the water should pass over the Tow-path, one foot high would probably be sufficient, and 1,500 Rupees the cost. If the Southerly wind did not make it obligatory to form the Tow-path on the SW. Bank, that Bank is preferable to the NE. Bank, because the outlet of South-west division of the Lake being the Byah Nullah; there are very few Nullahs running into the Lake Channel through the SW. Bank. This Bank is lower by three or four inches than the other, which will make the first cost a little more, but the expence of keeping it up will not be so great.

" 13. The next work I have to mention which has been frequently recommended by Captain T. Prinsep, is that of giving the Banks of the Balliaghatta Canal a greater slope. This work was partly authorized and executed at the West end of the Balliaghatta Canal: but not carried the whole length, as it would reduce the breadth of the Roads so much. This objection might be avoided by diminishing the height of the Banks at the same time that the slope was increased, which would have the further beneficial effect of preventing the sliding of the Banks by their great weight. This work has been estimated at 3,390 Rupees. If the sliding and falling in of the Banks only rendered the Roads impassable, it would be of little importance; but the earth fills up the Canal which cannot be cleared out again, except at a very great expence, compared with the prevention of the evil.

" 15. I have collected much information on the tides in the Sunderbund Canals, which I shall defer reporting on until November next, when one year's series will have been complete. The removal of several of my Tide Gauges has induced me to defer taking soundings of the depth for the present; and as I did not receive from the Military Board the plans and sections of these Canals until after my return from visiting them, I have not been able to make such a satisfactory report on the changes that have taken place in them, that I could have wished.

" 16. For the purpose of making the Tow-paths, authorized by the Military Board's Letter, 8th May 1833, I hired in the month of November 1833, twenty-two Coolies, who have completed the Tow-path from Baminghatta to Bungerhot, nearly finished the work at Chytul, and will commence at Hoossainabad immediately. These Tow-paths, as far as they have been made, are a greater accommodation to those navigating the Canals than I last year supposed they would be. They have been all made along the South Bank, as the Boats can only be tracked from that side during the SE. monsoon, when the greatest traffic is passing through the Canals—during the past year, the greater part of the ground from Hoossainabad to Hinshee Khaul has become occupied, the jungle cut, and Embankments formed. I have taken advantage of those Embankments for tracking paths, and directed the jungle between them and the Nullahs to be cut at a height of three feet from the ground; but, as it is the interest of the proprietors to encourage the growth of the jungle between their Embankments and the water, I expect that the work will be put a stop to very soon. The right of Government to a tracking path along navigable watercourses is a subject of the greatest importance, not only to those Canals but to the inland navigation of Bengal, two-thirds of which is carried on by tracking. I have to request instructions for my guidance on this point.

" 17. Section No. 7 is a section across the Baminghatta Canal, it is given as an example of the slopes that the Banks of a Canal assume when excavated in the black clay, which forms the greater part of the soil of the Sunderbund, and will form an excellent guide in making Canals or Drains through a similar soil.

" 18. No change appears to have taken place since last year in the Baminghatta, Bhojediggy, Goonamagie or Chultabarya Canals, except that Bunds have been made across the Dood-beebie Khaul, to the Northward of the Goonamagie Canal. There were Dams across this Khaul before the Canals were executed, but they were removed by Captain Prinsep for the purpose of getting a greater scour through the Chultabarya Canal, the intended effect does not appear to have been produced, so that the closing this Khaul is a matter of no importance.

" 19. The Bhowanypore, Baley-Gunge and Hoossainabad Canals appear to have widened a little during the past season, particularly the last mentioned. The Chytul Canal has not changed in any respect. The three first mentioned Canals are much more frequented by Boats of every size than the Canals to the Westward; although the Bhowanypore Canal is very shallow, yet they prefer it to the large Channels connected with the Roymungul, which

may be considered as impassable at this season of the year. The Salt Darogahs at Hoossainabad mentioned, that 5 or 600 Boats passed through these Canals daily, sometimes 1,000. I supposed from my own observation, that there were about 300 Boats or 150,000 maunds per diem.

“ 20. The Bhowanypore Canal was dug two or three times, but is at present the shallowest in the whole line; this arises, as you are aware, from the sandy nature of the soil, and not from the stillness of the water, a strong current runs through it, which would be greater if the Canal was deeper and of more uniform width. If it is intended to keep the navigation of these Canals open, it will be necessary to excavate this Canal again, and to repair the Bank. This would be a business of much difficulty, but not impossible. The Bank would have to be built up with fascines and a puddle wall behind them, to prevent the sand oozing through. I have not taken measurements sufficiently accurate to enable me to make an estimate of this work; and, as the quantity of water passing through this Canal is increasing, the work may not be required for some years. I have given two sections of this Canal, No. 8 is taken where the bed of sand about 2 feet thick, between the black upper soil and yellow clay sub-soil, has been washed out: Section No. 9 is at that part of the Bank formed entirely of fine sand, to repair which appears nearly hopeless. The oozing of the sand through the Banks of this Canal, caused by the water lying on the ground at the back of each of the Banks, appears to have been increased by the Nullahs, which usually allow this water to drain off, having been dammed up by the people connected with the salt manufacture. There are fewer of these Nullahs dammed up this year than last year. I shall endeavour to prevent these dams being made in future.

“ 21. I have to request permission to keep up the gang of Coolies next season to cut jungle, repair and increase the length of the Tow-paths, and remove sunken Boats and trees. The cost will be 1,500 Rupees during the year, including Boat hire, rope, tools, and other contingencies: a bill for the expences of the past year will be sent in when the work is concluded in the month of June.

“ 22. I shall take this opportunity of correcting a mistake in my last year's Report, respecting the proper time that Boats should leave Hoossainabad, to proceed Westward by the Canals. The best time is about quarter to half flood-tide, because they will have the flood-tide up the Gobra Khaul pass through the Bhowanypore Canal at high-water, and go down the Hinshee Khaul with the ebb.”

(No. 216 to No. 223 inclusive, omitted.)

No. 224.

No. 141.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 19th November, 1834.

The Estimate for digging out the Balliaghatta Canal having been authorized by the Board's Letter 2199, dated 26th August, I have the honor to request instructions respecting the disposal of the earth that will be carried into the Salt Water Lake. I proposed in para. 12th of my Letter No. 1, dated 10th May last, to form Embankments and Tow-paths on the Lake Channel with it, but these have not yet been authorized. When the Estimate for

these Tow-paths was sent, my experience of the depth of the water in the Salt Water Lake was formed from the observation of two rainy seasons, in which comparatively very little rain fell. The experience of the past season however, has induced me to recur to my former Estimate of 3,000 Rupees for Embankments, two feet six inches high.

2nd. With reference to this subject Mr. G. A. Prinsep has made a proposal, that if the Embankments is made in the manner proposed by me, so as to cut off all communication between the Lake Channel and his salt works, he will not consider that his interests will be injured by admitting the Hoogly River water at the Chitpore Locks.

I have the honor to be, &c ,

(Signed) J THOMSON, Captain,
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces

(No. 225 to No. 227 inclusive, omitted.)

No. 228.

No 130

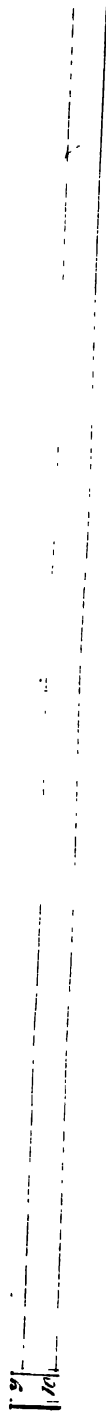
EXTRACT OF A LETTER FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

To COLONEL R. TICKELL,
Superintending Engineer, Lower Provinces

Calcutta . 30th October, 1834

" At the conclusion of the rains I have the honor to Report, that the quantity of sediment brought into the Circular Canal this season, is more than twice as much as the yearly average. The quantity deposited by the Narculdanga Drain is 213,000 cubic feet, and by the other Drains in proportion. The least depth of water at Narculdanga is one foot 8 inches, Manicktollah 2 feet 6 inches, Nundun Bagan Drain 2 feet 2 inches. These depths are measured from the zero of Captain Prinsep's Guage. I have not yet received authority for commencing the construction of Mud Boats for the Dredging Boat, so that I cannot deepen the Canal with it before the month of March, supposing I received the authority now. The height of the River Hooghly is at present 7 feet above the average level; and I cannot expect that I shall be able to open the Lock-Gates before the end of November, by this latter means I may succeed in deepening the Canal about 2 feet, but as the Salt Water Lake falls a foot below the zero in the cold season, there will remain only 2 feet 6 inches water in the Canal, which will prevent loaded Boats passing through it."

No. 229 omitted.)



Sections of the bottom of the Circular Canal taken near the Narvuldanga Bridge
at the following times

1	December	1833
15	March	1834
1	July	
21	October	
28	November	

Canal dug out to this depth
26 Inches of rain had fallen up to this time
The Lock Gates had been open 16 days

Scale for distance 500 feet to 1 Inch

(Sig) J. Thomson Capt. R.
Sup. of Canal

No. 230.

No. 142.

EXTRACT OF A LETTER FROM CAPTAIN J. THOMSON,

Superintendent of Canals.

To COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 28th November, 1834.

"I have the honor to reply to the questions stated in your Letter No. 2120, of the 26th instant, as follows:—

"2nd. The annual average quantity of sediment from each of the Calcutta Drains is about 90,000 cubic feet: this was ascertained by the quantity dug out of the Entallee Canal, and what was dredged and dug out of the Circular Canal. Colonel Wood's Committee, on Mr. James Prinsep's information, assumed the above quantity, and reported it to the Military Board, with reasons for their opinion (I have not a copy of their Report): my experience has not induced me to make any alteration in this assumed fact.

"3rd. The quantity of sediment deposited this year by the Narculdanga Drain has been ascertained by several soundings taken before and after the rains. The calculation of the quantity of deposit from the soundings was corrected, by the observations made when the Canal was dug out last February.

"4th. The quantity of rain that fell from 1st of June to the 31st of October of this year, was, by the Register in the Asiatic Society's Journal, 61 inches, and during the same season of last year, 25½ inches fell: my opinion is, that eight or nine inches per month is the average quantity that falls during the rainy season."

No. 231.

No. 2287.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

To CAPTAIN E. P. GOWAN,

Officiating Secretary Military Board.

Barrackpore: 9th December, 1834.

Canals.

SIR,

I have the honor to forward the enclosed sketch received from Captain J.

Thomson, Superintendent of Canals, of the effect of the Narculdangah Drains on the depth of the Circular Canal for the past year, being a continuation of that Officer's Report No. 130, of the 30th October last, (a copy of which was transmitted with my No. 1851, dated the 3rd ultimo) and showing the effect of opening the Lock-Gates, which has increased the depth at the Narculdangah Bridge two feet, as was anticipated.

(True Copies.)

E. P. GOWAN,

Officiating Secretary Military Board.

No. 232.

No. 4370.

FROM THE MILITARY BOARD,

TO HIS EXCELLENCY THE RIGHT HONORABLE

LORD WILLIAM C. BENTINCK, G.C.B.,

Governor General of India in Council.

Fort William: 6th January, 1835.

MY LORD,

In continuation of our Letter No. 2,662, of the 23rd September last, we have the

Reporting the quantity of sediment brought into the Circular Canal during the rains of 1834.

*No. 1851, of the 3rd November 1834, from Colonel Tickell, with enclosure.

No. 2204, of the 3rd ultimo, from Colonel Tickell, with enclosure.

No. 2287, of the 9th ultimo, from Colonel Tickell, with sketch.

honor to submit for the consideration of your Lordship in Council, the documents noted in the margin,* on the subject of the sediments brought into the Circular Canal this year by the Calcutta Drains, by which it appears that the average quantity brought down by each of the eight Drains falling into that Canal is 90,000 cubic feet, or in all 720,000 cubic feet. The measurement given by Lieutenant Colonel Wood's

Committee, of which Major Irvine and Captain Forbes were Members, gave the quantity at 883,000 feet.

2nd. The accompanying Chart shows the extent of silting opposite one of the Drains, and the effect of the scour of 10 days in dispersing it by opening the Lock in October last.

3rd. The majority of Board remark, that Captain Thomson's statement of the actual quantity of sediment cleared out at the time the Canal was laid dry, would not warrant the expectation of so large an influx this year. It must be difficult to estimate the solid contents of heaps or mounds of mud under water.

We have the honor to be,

My Lord,

Your Lordship's most obedient humble Servants,

T. C. ANBUREY, Colonel, Chief Engineer, Member Military Board.

A. GALLOWAY, Officiating Member Military Board.

D. McFARLAN, Officiating Member Military Board.

G. YOUNG, Captain, Officiating Member Military Board.

(No. 233 to No. 236 inclusive, omitted.)

No. 237

No. 84.

FROM CAPTAIN J. THOMSON,

Superintendent of Canals,

TO CAPTAIN E. P. GOWAN,

Secretary to the Military Board.

Calcutta: 20th August, 1834.

SIR,

I have the honor to acknowledge the receipt of Letter No. 1904, with the instructions of the Board regarding the objects contemplated by the Circular Canal and its preservation, and to state the plan of operations recommended for carrying these objects into effect with economy and regard to private interests. With the exception of the first proposal, the "maintenance of the requisite depth of water at all times," which can only be

partially effected by the following rule, all the others will be attained by admitting the water from the River at all times that the high-water in the Hoogley does not exceed the high-water in the Lake by 5 feet. The diagram accompanying this Letter will show the times that the Gates would be opened according to this rule, viz., when the high-water in the Hoogley marked by the blue lines are below the red line, which marks the 5 feet above high-water in the Lake. It appears by this diagram, that after the first springs in December until the second springs in March, the larger Lock Gates may be thrown open and fastened back in their recesses : from the 1st August till the first of November they will have to be closed entirely, because although the high-water neap-tides is below the red line, yet the low-water neap-tides do not on all occasions fall below those of the Lake, in which case there would be a constant current from the River to the Lake which would not permit the Gates to be closed until low-water spring-tides, unless the Log-Dam was put down ; during the rest of the year, from the second springs in March till the first of August, and from 1st of November till the first spring in December, the Gates would have to be closed occasionally during spring-tides.

2. This rule only holds good during the present obstructed state of the Balliaghatta Canal, when that Canal is cleared of Boats, &c., so as to be navigable, the red line in the diagram will probably have to be lowered 6 or 9 inches.

3. I may further observe, that observations during the past year has shown, that during the months of January and February, and occasionally at other seasons, the tides at Bhaminghatta fall below the tides in the Hoogley River, and consequently the water in the Balliaghatta Canal is retained at its present height only by the shallowness of it and the head of the Lake Channel, if therefore the Canal and Lake Channel were deepened the water would run off more freely and be shallower than it now is. The following instance will prove this. In Captain Prinsep's time, the Balliaghatta Canal had an average depth of 3 feet 4 inches, the fall of the tide at Koolya Bridge 10 inches, and at Chingreeghatta 1 foot 8 inches. At present the average depth of the Canal [is] 5 feet 3 inches, the fall at Koolya Bridge 2 feet, and at Chingreeghatta 3 feet 9 inches or 4 feet. In stating that by digging the Canal deeper it would be proportionally shallower, it will be understood that the level of the surface of the water will be lowered at low-water, and the Circular Canal and other parts of the Canal not excavated, will be shallower at that time, but where the Canal is dug out there will be the same depth of water as at present. To increase the depth of water in this Canal is fortunately easily accomplished by damming up the Nullahs running into the North side of the Lake Channel, as already proposed and Estimated for : by this work the outlet of the north-east part of the Lake will be so contracted, that the water would not fall more than 1 foot during low-water, it would therefore preserve about 2 feet more water in the Canal.

4. To preserve the depth of water in the Basin between the Locks and the River, the smaller Gates should be opened on the 1st February for a fortnight or three weeks to scour it out.

5. It is a question for the Board to decide whether the smaller Gates might not be fastened back at the times the larger Gates were : and the Establishment at the Locks dismissed for three or three and a half months, with the exception of the Tindal, two Klassies and a Diver, who, as acquainted with the management of the Lock, must be retained, but might be employed on other work. The consequence of opening the smaller Gates during three or four months would be, that the Balliaghatta Canal and the East end of the Circular Canal would be reduced in depth about 6 inches, and the West end of the Circular Canal would fall $3\frac{1}{2}$ or 4 feet, although heavy laden Boats could not navigate with $3\frac{1}{2}$ or 3 feet, yet there would be no more delay to the navigation than if the water was retained in the Canal by closing the Gates, because that part of the Channel between the Gates and the River has now only 1 or 2 feet at low-water. The flux and re-flux in the Canal would

cause a double scour, and be convenient to the navigation, but would bring so much salt water into the Canal that it would not be drinkable East from Manicktollah Bridge during low-water.

6. The only other object to be considered is the preservation of the depth of the Canal opposite the mouths of the Calcutta Drains, the most economical method of doing this (not already considered) is by the Steam Dredging Boat, which works at one-sixth the cost of the hand-dredging Boats, and would be much cheaper than by digging out by hand-labour if the interest of individuals residing on the Banks and the loss of tolls were considered. The loss of tolls and inconvenience to the public by closing the Circular Canal every year, is undoubtedly under the present Regulations of no importance, but the comparison made above, is in expectation of an improvement in this respect speedily taking place—I allude to the Customs Regulations and not to the Judicial or Fiscal. In this statement I have not mentioned the current and slopes of the water in the Circular Canal, as I could not put them in an intelligible or useful form. The constantly changing current caused by the variable rate at which the tide rises is modified by waves, or alternate rising and subsiding of the water three or four times during each tide. The average rate of current corresponding to a tide of any particular height might be ascertained by using one of Massey's Patent Logs, this information would be of no use towards the preservation of the Banks, as it is the greatest current that does the injury and not the average rate. The remarks refer principally to the currents through the Lock, those in the Circular Canal depend greatly on the obstructions that may happen to be in the Balliaghatta Canal: a large sunk Boat in this latter Canal will reduce the current half in the former Canal.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 238.

MY DEAR GOWAN,

I can only put my explanation in other words as follows:—

The low-water at Bhaminghatta is on a level with the bottom of the Circular Canal, and one foot three inches below the bottom of the Balliaghatta Canal, and the only reason that the whole of the water does not run out of these Canals at low-water is the obstruction to its so doing by the shallowness of the head of the Lake Channel and of the Balliaghatta Canal: if these shallows are deepened more water will run out of the Canal at low-water, and consequently the Canals will be shallower. For example, at Chingreeghatta at low-water spring-tides in December, there is one foot water: if the Canal was deepened as intended, one foot three inches, there would only be one foot water, and the surface of the water would be lowered one foot three inches.

This fall of the tide at Chingreeghatta of 15 inches will cause a fall in the Circular Canal, at the Barrackpore Bridge, of about four inches, and at the junction of the two Canals of nine inches.

Your's truly,

J. THOMSON.

(No. 239 to No. 249 inclusive, omitted.)

No. 250.

No. 150.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals.

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta: 23rd December, 1834.

SIR,

Having commenced the repairs of the Sunderbund Canal Tow-paths, I have the honor to request instructions respecting the cutting jungle between the Embankments of land and the navigable Channels in the Sunderbund, referred to in paragraph 16th of my Letter to you, No. 1, of the 1st of May last.

2. I repaired last year the Banks of the Sunderbund Canals, but they have been again cut to allow the water to run off the land and to catch fish. I have complained to the Magistrate of the 24-Purgunnahs at the time that the offence was committed, but no effectual remedy has been applied. I will therefore not repair these Cuts this year, because when again cut a larger portion of soil will be carried into the Canal than if they are permitted to remain in their present state.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 251 to No. 254 inclusive, omitted.)

No. 254 $\frac{1}{2}$.

No. 5539.

FROM THE MILITARY BOARD,

TO HIS EXCELLENCY THE RIGHT HONORABLE
LORD W. C. BENTINCK, G.C.B.,
Governor General of India in Council.

Fort William: 3rd March, 1835.

MY LORD,

We have the honor herewith to submit for the consideration of your Lordship in Council, the undermentioned Estimates, and to recommend that they be sanctioned.

Recommending two estimates by Captain J. Thomson, for excavating the Balliaghatta Canal and making Tow-paths in the Salt Water Lake. Estimate (No. 290, Book B. of 1834-35, Military Board Office) by Captain Thomson, Superintendent of Canals, of the probable expence of making Tow-paths on the Salt Water Lake, amounting to Sicca Rupees 3,275 : 0 : 0.

Estimate (No. 291, same Book and Office,) by the same Officer, of the probable expence of excavating the Balliaghatta Canal, from the junction of the Circular Canal to the Salt Water Lake, to the same section as the Circular Canal, viz., 72 feet wide at zero, 30 feet deep, and reducing the height of the Banks, and making them to a slope of 2 to 1, amounting to Sicca Rupees 5,000 : 0 : 0.

2. The excavation of the Balliaghatta Canal, and reducing the height of its Banks and the formation with the excavated earth of a Tow-path in the Salt Water Lake, have since May last been recommended by the Superintendent of Canals and the Superintending Engineer, Lower Provinces, as measures absolutely necessary for the free navigation of that Canal; but unwillingness to increase the expence already incurred on these Canals, and the apprehension of destroying confidence in the holders of ground on their Banks, by closing them for a further period so soon succeeding the shutting up of the Circular Canal, induced us to postpone the work.

3. The estimate now submitted is for deepening the Balliaghatta Canal by means of the Steam Dredger, which it is stated will not involve the necessity of closing the Canal, and which besides being the most appropriate work for the Dredger, (determined to be kept up) reduces the probable cost considerably below the former estimate, which was Rupees 10,226 : 6 : 0.*

* Proceedings
6th May 1831.

4. The construction of Tow-paths on the Salt Water Lake has been considered desirable, not only as affording the best means of disposing of the earth that must be dug from the Balliaghatta Canal, but as affording the means of towing Boats and preserving a sufficient depth of water at the head of the Lake Channel and entrance into the Balliaghatta Docks.

5. In his Letter No. 177, of the 17th March, 1834, to the address of Colonel Tickell, Captain Thomson observes, that "the principal difficulty to be met with in this work (digging out the Balliaghatta Canal) is the disposal of the earth that is to be dug out. If piled up in a wet state on the high and steep Bank, the whole would certainly fall in; and to buy tanks or hire ground on which to place it, together with the carriage, would considerably exceed the present estimate:" he goes on—"independent of the proposed measure for deepening the Balliaghatta Canal, I continue of opinion that the Banks should be cut down for the purpose of preserving them and getting an increased width of Road.

6. On the same subject, this Officer observes in his Letter No. 141, of the 19th November last, to the address of Colonel Tickell—"Mr. G. A. Prinsep has made a proposal, that if the Embankment is made in the manner proposed by me, so as to cut off all communication between the Lake Channel and his salt works, he will not consider that his interests will be injured by admitting the Hoogly River water at the Chitpore Locks."

7. Under the above circumstances, and the rates of earth-work, considering its nature being moderate, we have no hesitation in recommending that the above estimates be sanctioned.

8. An advance of Sicca Rupees 5,000 for clearing the Balliaghatta Canal is required by Captain Thomson, by an assignment on the Collector of the 24-Pergunnahs.

We have the honor to be,

My Lord,

Your Lordship's most obedient and humble Servants,

T. C. ANBUREY, *Colonel, Chief Engineer, Member Military Board.*

A. GALLOWAY, *Officiating Member Military Board.*

D. McFARLAN, *Officiating Member Military Board.*

G. YOUNG, *Captain, Officiating Member Military Board.*

No. 254 $\frac{1}{2}$. a.

CANAL DEPARTMENT.

Estimate No. 7.

Estimate of the probable expence of making Tow-paths on the Salt Water Lake, called for in Military Board's Letter, No. 4033, of the 19th December 1834.

Description.—The Tow-paths to be Embankments of the undermentioned section—at such parts of the Bank of the Lake Channel as are not dry at low-water, a row of guran stakes, 18 inches apart, will be driven in, and brush-wood put in between them so as to prevent the earth being washed away by the rising tide during the construction of the Embankment. The Nullahs will be dammed up in a similar manner.

Section of Tow-paths.

According to the details given in estimate No. 4, dated 9th December 1833, the work in 1000 yards of Embankments will be—

22,342 cubic feet of embanking below water.

111,960 ditto ditto above water.

400 running feet of staking with brush-wood.

Estimate of the expence of Embanking 1,000 running yards.

111,960 cubic feet of embanking above water, (@ 3 Annas per 100 cubic feet, ...	209	14	10
22,342 ditto ditto below water, (@ 8 Annas per 100 feet, ...	111	11	6
400 running feet of staking, (@ 16 Rupees per 100 feet, ...	64	0	0
	385	10	4

Rate.

Or about 13 Rupees per 100 running feet.

Abstract.

Embanking East side of the Channel from Balliaghatta to No. 2 Chowkee,			
6000 feet, @ 13 per 100, ...	780	0	0
Ditto West side of the Channel from Chingreeghatta to Bya Nullah, 9,500 feet, @ 13 per 100, ...	1,235	0	0
Ditto from Bya Nullah to Baminghatta, not including the larger Nullah, 18,000 feet, @ 7, ...	1,260	0	0
Total Sicca Rupees,	3,275	0	0

CALCUTTA,
SUPERINTENDENT CANAL OFFICE :
24th December, 1834.

J. THOMSON, *Captain,*
Superintendent of Canals.

* This Document was sent to Government but not returned—Calculations only examined.

No. 254½. *b.*

CANAL DEPARTMENT.

Estimate No. 8.

Estimate of the probable expence of excavating the Balliaghatta Canal, from the junction of the Circular Canal to the Salt Water Lake, to the same section as the Circular Canal, viz. 72 feet wide above, 30 feet wide at bottom, 7 feet deep, and reducing the height of the Banks and making them to a slope of 2 to 1, authorized by the Military Board's Letter, No. 2199, dated 26th August 1834. See my Letter No. 77, of the 7th August 1834, my estimate No. 15. of the 17th March 1834, and my Letter No. 57, of the 18th July 1834.

Excavating 1125 Chowkas of mud, or eleven weeks' Dredging, @ 250 Rupees			
per week, including establishment and Repairs, ...	2,750	0	0
Contingencies consequent on the carriage of the mud to the Salt Water Lake,	250	0	0
Repairing the Roads and Drains, cutting down the Banks, and forming the slopes			
and carrying about 1,000 Chowkas of earth into the Salt Water Lake, ..	2,000	0	0

Total Sicca Rupees, 5,000 0 0

CALCUTTA,
SUPERINTENDENT CANAL OFFICE :
24th December, 1834.

J. THOMSON, *Captain,*
Superintendent of Canals.

(No. 255 to No. 277 inclusive, omitted.)

No. 278.

No. 170.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals.

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta : 23rd April, 1835.

SIR,

With reference to your Letter No. 3407, enclosing the Military Board's Letter No. 6496, [of the 14th instant,] I have the honor to bring to your notice, that two cases to the point in question were put in my Letter No. 161, of the 18th March, viz., "my right or otherwise to cut the jungle on the Banks of the Sunderbund Canals to permit tracking along them, and the extent of my authority to prevent any one making Cuts through the Banks of the Canals or Channels.

2. By the 2nd paragraph of the Military Board's Letter, the right of the public to the use of the Banks of navigable Channels for the purpose of tracking is allowed; but in the 3rd paragraph, existing private interests are made an exception. The justice of the case appears to me to be however, that the right of tracking being inherent in the public, no grant to an individual can interfere with that right, unless particularly specified in his grant

by Government. I hope to be excused mentioning an example. The Magna Charta of England directed the removal of all mill-dams, fishing weirs, and every obstruction whatever from all navigable waters in England, without any remuneration to the parties whose property they were. The original right of the public is thus shown. Also by Regulation VIII. of 1824, the Bengal Government gave considerable powers to the Supervisor of the navigation of the Nuddea Rivers to remove trees and other obstructions on the Banks of the Rivers that might interfere with the navigation.

3. If the Bengal Government do not, by a Regulation or other Act, declare the right of the public to the use of the Banks of navigable Rivers, but allow the proprietor of the land a remuneration for the use of his land in any single instance, tracking will be put a stop to entirely; there is now more than 7-8ths of Banks of Rivers free and open, but they would all be closed if any particular case was to be considered on its own merits, as proposed by the Military Board; as no negociation could be entered into with an individual except on the principle of paying for any damage done.

4. In the artificial Canals, a tracking path must of course be paid for, but no one possessing the land on the Banks can, with any justice, make Cuts so as to drain his land into the Canal, as is now the custom.

I have, &c.,

(Signed) J THOMSON, *Captain,*
Superintendent of Canals

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces

(No. 279 to No. 287 inclusive, omitted.)

No. 288.

Extract of a Letter No. 17, dated the 1st August 1835, from CAPTAIN JOHN THOMSON, Superintendent of Canals, to COLONEL R. TICKELL, C. B., Superintending Engineer, Lower Provinces.

"2. In taking soundings in the Canals, I am happy to observe that the current which was admitted to run through the Canal when the Paddle Sluices were under repair in May and part of June, has almost entirely swept out the sediment from both the Circular and Balliaghatta Canals, more particularly the latter; in the former not much impression has been made on the deposit opposite the mouths of the Nundeen Beghan and Narculdanga Drains. The current admitted into the Canal was, no doubt, stronger than it would have been advisable to allow if the necessity of keeping the Gates open had not existed, but it has only injured the Bank of that part of the Canal which is improperly obstructed with Boats, so that if sufficient authority was granted for regulating these, the mud could be scoured out and a very great saving in dredging might be made, perhaps three-fourths of the annual Estimate, or 4,000 Rupees. I do not, of course, anticipate that the Lock Gates will be closed another year, on account of the salt works at Balliaghatta."

(True Extract.)

E. SANDERS,
Secretary Military Board.

(No. 289 and No. 290 omitted.)

No. 291. a.

A.

*Extract from a Dispatch from the Hon'ble the Court of Directors,
No. 4, dated the 14th May 1834, in the Revenue Department.*

" Para. 6. The Jellinghee and Bhagaruttee Rivers appear to be becoming progressively more and more difficult of navigation, and to require a great and increasing expence for keeping them open. We wish you to consider whether by bestowing on the Bhagaruttee alone the whole of the attention and labour now bestowed on both Rivers, a more effective navigation might not be secured. We trust however, that the new Canal through the Sunderbuns will answer the expectations that have been formed respecting it, and render the navigation of the Jellinghee and Bhagaruttee a matter of less importance than it has hitherto been. The operations on the Mattalhangha have our approbation."

[Paras.] 31 to 41, also Letter dated 21st December, 1830. Paras. 46 to 59.
Ditto, 16th August, 1831. Paras. 11 to 14.
Ditto, 24th July, 1832. Paras. 17 to 19.
Nudda Rivers and Dredging Boats.

No. 291. b.

B.

Extract from a Resolution from the Hon'ble the Governor General of India in Council, in the Revenue Department, passed on the 6th April, 1835.

" 2. The Proceedings reported in paras. 43 to 50 of the same Dispatch, will also have explained the reasons which influenced Colonel McLeod and Captain Forbes in preferring the Jellinghee River to either the Bhagaruttee or Mattabhangha, as best calculated to secure a free communication between the Ganges and the Hooghly, in the absence of means for affording a permanently navigable Channel between these two Rivers, and until the practicability of the scheme suggested by these officers of cutting a still-water Canal from Rajmehal on the Ganges to Mirzapore on the Hooghly shall have been determined upon, after the completion of the Survey now in progress, it will be unadvisable to resume the operations heretofore carried on for the purpose of improving the Channel of any of the three streams above-mentioned, especially now that the establishments under Mr. May have been broken up, and his own services directed to other quarters.

" 3. With respect to the new Canal through the Sunderbuns, it is to be lamented that the Reports of Captain Jenkins and of Mr. James Prinsep are unfavourable to its success. These Reports have been already brought to the notice of the Hon'ble Court in reporting the Canal operations of 1830-31 and 1831-32; a separate Report on this particular Canal has been promised in the present Superintendent's letter, dated the 10th May last, to Colonel Tickell's address, and the attention of the Military Board will now be called to the subject, in order to ascertain how far the Canal has answered the purposes for which it was executed."

Miscellaneous Revenue Consultation, 29th September 1834.
No. 6, Para. 15.

(No. 292 to No. 294 inclusive, omitted.)

No. 295.

No. 36.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

Calcutta: 17th October, 1835.

SIR,

I have the honor to Report for your information, the quantity of mud in the Circular Canal at the close of the rains, and previous to opening the Gates.

Drains opposite to which the mud is deposited.						Quantity of mud. Cubic feet.	Least depth of water Below Zero.
Balliaghatta	Drains,	..	..	..	..	3,200	6 4
Sealda	ditto,	..	..	..	..	16,000	6 0
Narculdanga	ditto,	..	..	..	..	175,000	1 8
Manicktullah	ditto,	..	..	..	..	50,000	3 2
Nunidun Baghan	ditto,	..	..	..	..	63,000	3 1
Ultadanga	ditto,	..	..	..	..	3,400	6 4
Baghbazar	ditto,	..	..	..	..	3,400	6 2
						314,000	

(True Copy.)

E. SANDERS,

Secretary Military Board

(No. 296 to No. 319 inclusive, omitted.)

No. 320.

Extract—Copy of a Memo. given to D. McFARLAN, ESQ., Chief Magistrate, by Captain JOHN THOMSON, after perusing Military Board's Report on the Circular Canal.

“ Para. 28. The inconveniencies and obstructions in Tolly's Nullah and the Canals are now so great, that the removal of these obstructions or making another Canal, the Tolls might be doubled or quadrupled without reducing the Toll on the others a single Rupee.

“ The money extorted from the people, the loss and damage of Boats and goods, and the payment for the hire of Boats and men, while they are delayed, amount in my opinion, to about one lac a year at least, and experience has shown, that the removal of a vexatious exaction of say 1,000 Rupees, would increase the traffic so as to give a return of 2, 3, or 4,000 Rs.

“ With respect to the last paragraph on the Town Drains, the bottoms of the Town Drains at the Circular Road are pukka, and have never been altered, the slopes beyond them (in two or three instances out of the seven) have been increased; but the delivery of these

Drains cannot now be more than one-fifth or one-sixth more than formerly, and there being 5 feet difference between the levels of some of them, no water now runs out of one : but is carried round about 3 miles (or more) to get out at another, so that I have seen the Narkuldanga Drain running nearly full a week after the rains had ceased. I have mentioned repeatedly in my Letters that the source of all the soil that is carried into the Circular Canal arises from the suburbs beyond the Circular Road. There are exceptions, 4-5ths or more of the Dhurruntollah mud comes from the Town, and half at least of the Nundun Baghaun Drain.

"Neither opening the Gates nor the Dredging Vessel can prevent the Circular Canal being closed for part of August, September and part of October.

"My complaints about the Customs Chowkies and the arrangement of the levels of the Town Drains have been decided on by the Board, but they nevertheless still exist, and the Government should know of their existence, otherwise they have reason to say they have been deceived.

"You will understand my meaning, although not very carefully worded."

(Signed) J. T.

(No. 321 to No. 325 inclusive, omitted.)

No. 325½. a.

Extract—Letter from Captain J. THOMSON, Superintendent of Canals, to Colonel R. TICKELL, C. B., Superintending Engineer, Lower Provinces, dated 1st April, 1835.

"The removal of the earth deposited in the Canal by the Town Drains has not been authorized, nor any measures adopted for the prevention of the serious evil, I beg to observe that the expence of cleaning out the Canal is increased three-fold by deferring the repairs from year to year, instead of making them immediately they are required. The first year's deposit retards the current in the Canal, and the next year's deposit is thereby greatly increased, at the same time the Tolls are reduced, as the best paying Boats (those that are loaded) cannot pass.

"6. Tolly's Nullah being in a worse state than usual this year, (as before observed) was closed at all times except four or five days each spring-tide, and in consequence of the bad arrangement of Boats it requires usually ten or fourteen days to get through; it must therefore occupy at present two or three tides (spring) to pass, or from a month to six weeks. The number of Boats going through the Circular Canal has, for the six weeks, more than doubled the former average, and on one occasion amounted to 125 Boats in the day. The tide not having been admitted by the Locks to remove the deposit from the Drains or to raise the surface of the Canal, only two feet nine inches water was the depth in the shallowest place at Nurculdanga Bridge, and I suppose two-thirds of the trade were excluded in consequence.

"7. The Entallee Canal is entirely filled up for 200 yards at the West end, and there is a large accumulation of mud in the remaining part of it, and the Koolya Bridge. Banks have slipped in several places. Reports of these circumstances have been made and estimates for repairs forwarded (3,381 Sicca Rupees). The West end of the pukka Road on the North-side at the Wood Bazar is entirely worn out, and in con-

sequence of the encroachments of the wood dealers, the Drainage cannot be kept clear, and is in a very bad state. When the Canal is authorized to be cleared out, estimates for the repairs of the Roads will be forwarded. The Road is not required while the Canal is in its present state.

“ 8. The Canal is to be dredged as soon as the Boat is ready : since the original estimate Balliaghatta Canal. was made (March 1834), the Banks have fallen in in several places, and there is probably 400 Chowkas more of mud deposited : this Canal continues in the usual state blocked up by Boats fastened across. The Roads are in a bad state, and frequently interrupted by obstructions and encroachments, it may be necessary for me to observe however, that when Mr. Wells was Magistrate of the 24-Purgunnahs, obstruction of all kinds were removed from the Canal and the Roads. The navigation was thereby kept open, and I did not hear of a single accident occurring. The reform in the police and management of this and the other Canals proposed by Captain T. Prinsep, 10 years ago, and which has been agitated since that time, is very much required.

“ 9. The Channel through the Salt Water Lake continues precisely in the same state that it was last year, and therefore requires no remarks. Former estimate was 3,275 Rupees.

“ 10. All these Canals are in the same state as last year with the following exceptions : The Hussanabad Canal has perceptibly widened, and also deepened a little at the East end—the Chaltabarryah Canal is considerably wider, but the Sand-bank near the West end has apparently increased a few inches—the Bhowannypore and Bayley Gunge Canals are decidedly shallower than last year. The impracticability of my preserving Tide Guages in these Canals prevents my reporting on the depths with certainty and confidence. The widening of the Chaltabarryah Canal has been caused by the number of Boats lying in that Canal obstructing the Channel and increasing the current, and as this widening has taken place opposite those places which were inhabited, and where grain was stored, all the ground bought for the Canals, has been washed down, and in some places ten feet more ; as there was [no] demand for ground at those places where any remained, none has been let.

“ 11. The number of Boats passing through these Canals do not exceed one-half or one-third of what they were last year, this arose from the navigation being obstructed at Calcutta, and also to some of the Canals being shallower. I had the Boats counted that passed through the Hussanabad Canal : the day I was there, 94 Boats passed Westward, estimated tonnage 20,000 maunds, and 59 Boats went through Eastward, estimated tonnage 25,000 maunds, or altogether 45,000, which shows the advantages of these Canals, and the superiority even in their present neglected state over the Sunderbund Channels. The expediency of keeping open the navigation of these Canals will also be apparent, particularly as I have it now in my power, by means of the Steam Dredging Vessel, to deepen and preserve the depth of them, and to meet this expence a Toll of One Anna per 100 maunds could be placed on all Boats passing the Hussanabad Canal, and Half an Anna on those passing through Chaltabarryah Canal. Unless the dredging had actually commenced in these Canals, and the money arising from the Tolls was paid directly from the former to the dredging expences, I am fully aware that the Toll would be avoided, and the Canal deserted : these Tolls would give 4 or 5 months' dredging every year, supposing they should cease to be collected when the work was stopped.

“ 12. One Thousand Rupees will be sufficient during the ensuing season to cut the jungle in the Tow-paths of the Sunderbund Canals, remove any trees and sunk Boats, and make petty repairs. These repairs are this season about half completed ; the proprietor of Lot LXXXIX. will not permit me to cut the jungle on the Banks of the Gobra Khal.

“ 13. After two years' experience I may be permitted to observe, that the duties imposed on me in the Canal Department cannot be efficiently conducted unless the cleaning out of the mud of the Canal as it is deposited, and the repairs of the Banks and Drains, are allowed to be charged from the current expences for the first 2 years, in consequence of the ruinous and

neglected state of the Canals : at present the current expences would be increased from 4,000 to 15,000 Rupees per annum, and afterwards 11,000 to 12,000 would be sufficient. This money would be more than re-paid by an increase in the collections from the Toll, but independent of any such hoped-for increase there are ample funds arising from the present Tolls, the legitimate object of which is (according to Regulation VII. of 1810,) to defray the expences of excavating the Balliaghatta Canal, and to provide for the repairs of it."

I have, &c.,

(Signed) J. THOMSON, *Captain.*
Superintendent of Canals.

No. 325 $\frac{1}{2}$. b.

Extract—Letter from Captain J. THOMSON, Superintendent of Canals, to Colonel R. TICKELL, dated 10th April, 1835.

"3rd. One of the consequences of considering the works generally necessary for the Canals under separate estimates and heads unconnected with each other is shown by the

* Para. 2nd It is not the intention of the Governor to incur any expence for the erection of a Bund across the Lake Channel or a Cut from Mr Prinsep's brine-fields to the Byah Nullah.

Extract in the margin,* in which the purpose of the work is lost sight of, and the nature of it misunderstood. The subject referred to is the Embanking of the Lake Channel.

It has been brought forward by me three or four different times, and this is the first answer that I have received, I therefore consider it my duty to put it in its proper light. The Embankment of the Lake Channel formed part of the original scheme for opening the Circular Canal, and was authorized by Government 14 years ago as part of the general plan, it was again sanctioned as a particular work in (or about) the year 1826, and money was advanced for it and the work partly executed. The probable reason for its not having been completed were stated in my last year's Report, and some of the advantages likely to arise from again undertaking it. These were to deepen the entrance into the Balliaghatta Docks, and thereby allow the Canal to be relieved from the superfluous number of empty Boats which now lay [lie] in it. These Embankments would also keep up a great depth of water in the Canal which is much required now, and likely to be more so from

† Which in consequence allows the Tide to run out much slower.

the increasing size of the Lake Channel:† another advantage is, that the Lake Channel can be navigated independent of

the tides and winds.

"4th. The object of this Letter being to request from the Military Board, permission to make all repairs required to the Canals and their Banks, so as to keep them in the state they were originally made, and to charge for these repairs in my monthly current expence Bills. I shall then be able to make * * * * * agreements with the work people, and select the most favorable season of the year: these will enable me to do the work with celerity and economy. When any repairs are authorized at present, I have to procure and instruct fresh workmen on each occasion, unnecessarily occupying my time and causing expence by the blunders they commit from ignorance. I am called on by your letter No. 3076, to prevent the recurrence of such blunders, but this is only possible by giving me sufficient work as to occupy the time of those who have been instructed in their business.

I have, &c.,

(Signed) J. THOMSON, *Superintendent of Canals.*

(No. 326 and No. 327 omitted.)

No. 328.

Extract of a Letter dated the 15th December 1835, from the Military Board to the Governor of Bengal.

" 11th. An estimate was submitted in April, 1834 by Captain Thomson, on the subject of the last item of expenditure before-mentioned, but his estimate included not only the expence of improving the Banks, but also of deepening the Balliaghatta Canal (East of the Koolya Bridge) by excavation.

" 12th. The latter part of this work was rendered unnecessary by the employment of the Steam Dredging Vessel, and latterly has, as stated by the Superintendent, been nearly superseded by the scouring consequent on the admission of a current of water through the Lock-Gates.

" 13th. The annexed Extracts from Captain Thomson's Letter, No. 24, of the 10th June, to the address of the Superintending Engineer, Lower Provinces, and of No. 57, of the 18th July, 1834, to the address of Captain Gowan, with the accompanying Sketch, furnish the necessary information, and point out the necessity of the proposed outlay."

No. 329.

No. 44.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

Calcutta : 24th November, 1835.

SIR,

In reply to your Letter No. 2801, respecting the embanked Tow-paths in the Salt Water Lake, I have the honor to report, that when I received information that the work was authorized,* I sent to Hazareebaugh for 200 Hill coolies, but am given to understand by the Assistant Commissioner that, in consequence of the disturbances of that part of the country, there will be some difficulty and delay in procuring them. A gang of 25 men arrived 5 days ago, these I had ordered previous to the rains for the Sunderbund Tow-path. These men commenced work this morning. During the rains I was able to throw a great deal of earth into the deeper parts of the water along the line of Embankments, and have thereby made about 200 yards, and filled up one of the large Nullahs.

2nd. A cause of difficulty and delay which it is not in my power to remove, is the crowded state of the Balliaghatta Canal, which prevents the earth, which I am dredging out of it, being carried into the Lake, this being the material with which the Embankment must be constructed at those places covered with water. There being no person on board the empty Boats, or those hauled upon the Banks of the Canal, tracking the Receiving Boats is prevented, and poling them together with the assistance of the tides is so tedious, that they may only make one trip by the day. Until this cause is removed, little can be done, and that at an expence much exceeding my estimate.

* Authorized by
Govt. on the 19th
August, 1835.

3rd. A further difficulty has arisen. On Saturday last, the two proprietors of the fishings of the Lake gave me notice that they would not permit me to shut up any of the Nullahs, unless they were remunerated for the damage done to the fishing thereby. This is rather unexpected, as I gave the parties notice 2 years ago that the work was to be done, to which I received no answer. To form some idea of the amount of their demand, I enquired what reduction of their payment of revenue they expected, and was told that they let each of the large Nullahs at 40 Rupees a year: this is nearly ten times more than the true rent; and it will be necessary to settle the point by jury, according to the Regulation, May 1824. I am not well acquainted with this Regulation, but am sufficiently acquainted with the general practice that, if the parties have much previous notice, stakes and nets will be put across every Nullah for the occasion—and would therefore propose, as I shall be absent for some weeks, that some person, accompanied by two or three competent and respectable witnesses, be deputed to visit all the Nullahs running into the Lake Channel on the NE. side, as far as the 2nd Chokey of Captain Prinsep's map, and all the Nullahs on the SW. side from Chingreeghatta to the Bya Nullah, and to note down the number of nets and fishing stakes which they may see, and the information they may collect from the fishermen they meet, getting the name of the witness and his residence.

4th. On the SW. side there is not more than one Nullah, in which there is likely to be a net; on the NE. side there are 8 or 10, but it will not be absolutely necessary to close more than two of them, the one that is now closed has made a decided improvement, both in the strength of the current at the mouth of the Canal, and in the direction of it. I need not detail the particulars.

5th. The uncertainty attending the execution of this particular estimate, will show how impossible it is for me to give such definite answers regarding the work in which I am engaged, as appears to be expected.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

J. A. CROMMELIN, *Captain,*
Executive Engineer, 1st Division.
For COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

No. 329½.

No. 4796.

TO THE SUPERINTENDING ENGINEER, LOWER PROVINCES.

SIR,

With reference to your Letter No. 2900, of the 3rd instant, I am directed by the Military Board to say that they consider the Report from Captain Thomson, which accompanied it, as very unsatisfactory, and to request you will desire that Officer personally to inspect the Nullahs running into the Lake Channel, number the fishing nets and stakes, and more fully Report on the complaints of the fishermen.

2nd. The Military Board are the more surprised at receiving a Report of so unsatisfactory a tenor on this work from Captain Thomson, as it is one that has been long contemplated and urged by him as of great advantage and necessity—there is no difficulty they observe now brought forward, which might not have been foreseen and provided against, and

some of the objections urged existed in full force at the very time his estimate was submitted, nor can the Board imagine that the progress of the work should be dependent on the arrival of a body of Hill men from the Mofussil, unless laborers are not procurable in Calcutta.

3rd. The work adverted to has been personally inspected by some of the Members of the Board during your absence from Calcutta, the spot where the Dredger is working is about half a mile from the Salt Water Lake, and between it and the Lake the Canal is by no means so obstructed with Boats as to render the free passage of the Mud Boats inconvenient or difficult, nor can they furnish the assertion that the Mud Boats can perform but one trip per diem, with an opinion, that so small a proportion of work is attributable solely to the obstructions they meet with in passing through the Canal.

4th. You are requested to urge Captain Thomson's attention to the necessity of prosecuting this work without delay: if on his inspection he thinks the proprietors of the fishing have any just claim, as he states, for recompense on account of the closing of the Nullahs, he will make a Report, stating the fact and the extent to which he thinks the recompense due. In reply to his proposition for deputing another person to perform the duty, the Board observe, that it is from Captain Thomson alone that a Report on this subject could be considered satisfactory, and they are disappointed at none having reached them, and no communication having been made specifying this difficulty till a call on him to report on the progress effected was made three months after the sanction of the work.

I have, &c.,

MILITARY BOARD OFFICE :

(Signed) E. SANDERS,

22nd December, 1835.

Secretary Military Board.

No. 329½.

No. 4795.

FROM THE MILITARY BOARD,

TO THE HONORABLE SIR C. T. METCALFE, BART.

Governor of Bengal.

General Department.

Department of Public Works.

HONORABLE SIR,

We have the honor to acknowledge the receipt of Secretary Mr. Prinsep's Letter, Report on the Tow-paths No. 311, dated the 11th ultimo, and in reply to submit copy of a Letter No. 44, of the 24th ultimo, from Captain J. Thomson, Superintendent of Canals, to the address of the Superintending Engineer, Lower Provinces.

2nd. We regret to find by Captain Thomson's Letter, that so little progress has been made and so many difficulties started by him in making the Tow-paths. These works are so necessary to the navigation of the Canals that we consider their occupation of great importance, we have therefore called upon Captain Thomson, for a fuller Report of the complaints of the fishermen adverted to in his Letter, and have urged his attention to the early completion of the work.

3rd. With reference to the management of the Chitpore Lock-Gates, we did not consider the question as only conditionally settled in Mr. Bushby's Letter, No. 232, of the 19th August last: in that Letter the Government have decided that Mr. G. Prinsep's interests are of subordinate consideration, and the Tow-paths were distinctly refused in Government

Letter of the 25th March last, on the supposition, that his interests alone were consulted in the arrangements, and their sanction was subsequently given to these works on the express understanding, that they were intended solely to improve the line of navigation in the Canals.

We have, &c.,

(Signed) T. ANBUREY, Colonel, Chief Engineer.
W. BATTINE, Colonel, Officiating Member Military Board.
MILITARY BOARD OFFICE : D. McFARLAN, Chief Magistrate, Member Military Board.
22nd December, 1835. A. IRVINE, Major of Engineers, Member Military Board.

(No. 330 to No. 334 inclusive, omitted.)

No. 334. a.

No. 8374.

Overseer Green begs leave most respectfully to Report for the information of D. McFarlan, Esq., Chief Magistrate, that owing to the Company's Drain being stopped up, at the entrance into the Canal, the water lodges in the Dhurmtollah Main Drain, about 225 yards in length and about 2 feet 9 inches in depth at the Eastern end, and at the Western end 2 inches. He begs leave to state, that if it is allowed to remain stopped up long it will occasion great stench, and will be a great annoyance to the inhabitants living near the Drain. The Drain has been stopped nearly a week.

CALCUTTA : (Signed) J. GREEN, Overseer.
20th January, 1836.

No. 334. b.

DEAR THOMSON,

This never can be allowed: a great evil is inflicted on the inhabitants of the end of the Dhurmtollah, I saw it this morning, and a more offensive nuisance was never inflicted on any neighbourhood. Let me know please how long it is to be so, and whether it cannot be avoided.

CALCUTTA : (Signed) D. McFARLAN, C. M.
20th January, 1836.

No. 334. c.

No. 8557.

24th February, 1836.

Overseer Green begs leave most respectfully to Report for the information of D. McFarlan, Esq., Chief Magistrate, that there is a great collection of water in the Dhurmtollah Main Drain owing to the mouth of the Canal being stopped, which reaches near the Union Chapel, and will be a great nuisance to the inhabitants if not opened soon. It extends North and South to Mr. Blaquiere's house on one side, and the Ghowkannah on the other. It is nearly a month since it was shut up.

(Signed) J. GREEN, Overseer.
(True Copy.) D. McFARLAN,
Chief Magistrate.

(No. 335 omitted.)

No. 336.

No. 71.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta: 4th March, 1836.

I have the honor to acknowledge the receipt of your Letter, No. 6086, of the 1st March, 1836, directing me without delay to let off the water accumulated in the Dhurrumtullah Drain. To carry this order into execution would at once and finally put an end to the work in the Entallee Canal. If the water from the Drain was now admitted into the Canal, it would fill up the Choukas or excavations that have been made, and soften the whole of the mud in the bottom of the Canal. To bale and pump the water out of the holes that have been dug, would occupy 10 or 12 days, and 10 or 15 days afterwards, if no rain should fall in the meantime, the work might be recommenced; but the Dhurrumtullah Drain would have in the intermediate 20 or 25 days become again filled, so that the water must again be let off and no work could consequently be done.

2. I have deferred carrying the Board's directions into effect, until I again hear from you, as the Board do not appear to have contemplated giving the work (of digging out the Entallee Canal) up altogether.

3. The 2nd paragraph of the Chief Magistrate's Letter, obliges me in my own defence to state, that the Dhurrumtullah Drain was closed for the second time on Monday, the 15th of February, and that since that time not a day or night has been lost by delay: there are now 500 men at work on the Canal, the number being daily increased as the mud becomes sufficiently dry for removal in baskets. If there is no rain before the 25th March, I shall probably be able to open the Drain on that day.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 337 to No. 343 inclusive, omitted.)

No. 344.

No. 19.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

SIR,

Calcutta: 10th August, 1835.

The superior economy and efficiency of preserving the navigation of the Canals open by preventing the falling in of the Banks, and the filling up of the Channel, instead of repairing the damage that may be caused by obstructions and encroachments, induces me again to bring to your notice the necessity of giving me power to execute the duties expected from my situation.

2nd. This subject was first brought forward by me in my Letter No. 31, of the 5th June 1833, in consequence of which, I was placed in communication with the Sudder Board of Revenue, by whom a draught of a Regulation was prepared. As this draught has not been acted on to this day, there are probably reasons for the delay of which I am no judge, as the proposed Act regulates not only my duties, but is intended to meet both, the deficiencies of the Police Regulations and also of the manner of collecting Tolls.

3rd. As you are fully aware from my numerous Reports of the injury that the Canals sustain by the rain water being permitted to run over the Banks, and thus cutting them into ravines and causing them to slide and fill up the Canal, I need not report instances of these occurrences, but state the immediate causes of them. Parties occupying the ground along the Banks are continually making encroachments, and as the Drain forms the boundary, it is in the first place filled up by them. To prevent these encroachments, there are two Chaprassies, whose sole business it is to Report and remove them; this method has entirely failed; as the Classies, I have reason to believe, make use of the power given them to raise contributions, and the few who are not permitted to encroach are those who have not the means to bribe. Two years ago, I complained to the Magistrate of the 24-Purgunahs against some of the principal proprietors of ground on the Banks of the Circular Canal, who had caused considerable damage to the Banks and Road by filling up the Drains; the Magistrate summoned the parties, but influential persons interfering in their behalf they escaped punishment, after some correspondence and a promise from the parties of not encroaching again. Since this occurrence, although attention is occasionally paid to my complaints to the Magistrate, I have not heard of any one being punished, or of any encroachments being prevented. A very vexatious consequence of this spirit of encroachment is, that all marks put up by me in levelling and surveying, and also for Tide Guages, are immediately removed, as I suppose they are considered land-marks. Trifling as this may appear, it prevents work being marked out with accuracy, or afterwards measured when in progress; and it more than doubles my own labor, and occupies my time with the duties that an Overseer could otherwise perform.

4th. Another obstruction in the Canals, injurious to the stability of the Banks and the depth of water, is the manner in which the Boats are fastened across the Canal, or anchored in the middle of it; the consequence of this is that sediment is deposited under the Boats partly from the current being obstructed, and partly from the filth and dirt thrown out of the Boats—and besides which a strong current is thrown against the opposite Bank of the Canal, which washes it down, depositing the earth below the obstruction. My appeals to the Magistrate to remove this evil were of no use until about 8 months ago, when the evil was effectually removed for a few weeks: but one of the parties who considered himself inconvenienced, appealed to the Commissioner, who cancelled all the Magistrate's orders on the subject; since that time the nuisance has continued as formerly.

5th. Provided the Boats in the Canals are properly regulated, and the Drains always kept open, there ought to be little or no expence incurred for repairs except for Roads and Bridges, and the removal of sediment brought into the Canal by the Town Drains.

6th. The obstruction caused by the Toll and Custom Chowkees are of little importance, as far as injuring the Banks are considered, which is the object I wish to explain in the present Letter.

7th. The foregoing cases which I have brought forward as examples are not meant as complaints against any one, but only to show the insufficiency of the present Regulations: and as some specific proposition is expected from me, I shall conclude by stating what I consider necessary to remedy the evils complained of. Although there is no doubt, but that both the Police and Fiscal Regulations of the Canals could be greatly improved, and at the same time facilitate the performance of my duties, yet I shall avoid introducing them in any

way, as it would only lead to delay similar to what is stated to have occurred in the 2nd paragraph of this Letter.

8th. The substance of the enactment proposed is—"That any person who shall wilfully hinder, or prevent the free passage of Boats on the Canals, or who shall encroach on the Banks so as to cause damage or obstruction, such offender shall, on conviction by a Magistrate, pay a fine not exceeding 50 Rupees, and also pay to the Superintendent of Canals a full satisfaction for the damage done, and the obstruction or nuisance laid on the Bank shall be forfeited and sold for the use of the Canal." I also require authority to seize and send to the Thannah any transient or unknown person guilty of the above offence.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 345 to No. 355 inclusive, omitted.)

• No. 356.

No. 783.

FROM COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces,

TO CAPTAIN E. SANDERS,
Secretary Military Board.

Barrackpore: 24th June, 1836.

Canals.

SIR,

With reference to your Letter No. 6968, of the 12th of April last, I have the honor to enclose copies of Letters received from Captain J. Thomson, as noted in the margin,*

* No. 14, dated 6th June, 1836. relative to a more permanent and economical measure for
No. 18, dated 17th June, 1836. preventing the filling up of the Canal by the Town Drains
Memorandum, dated 27th May, 1836, than the employment of the Steam Dredging Vessel.
relative to Dredging Vessel.
No. 19, dated 17th June, 1836.

2nd. The measure for this purpose referred to in the last paragraph of Captain Thomson's Letter, forwarded with my communication No. 4431, of the 14th of April, was principally the employment of Cess-pools at the mouths of the Town Drains, as a substitute for a former proposition not acceded to, for re-modelling the Drains and rivetting them with masonry.

3rd. When Captain Thomson first made the proposal for constructing these Cess-pools several objections were made to them at the time, and which still exist, besides which I understand that the depth and level of the Town Drains have been so materially altered within the last two years that it would be necessary before such permanent works as Cess-pools are made, to determine the quantity of water which each Drain should deliver, as also the level of the outfalls; but I agree most fully with Captain Thomson in the opinion, that if that portion of the Drains between the Circular Road and the Canal was put into a proper state by rivetting the sides, and adjusting the slopes, so as to regulate the velocity of the current, it might reasonably be expected that the current of the Canal would remove the greater part of the filth brought down by the Drains, more particularly if Hatches or Sluices

were put into the Lock-Gates, to produce a current through the Canals during the rains as well as the dry season.

4th. No Cess-pools would in that case be required, and on the completion of the works proposed for the ensuing season, nearly one-half of which are those remaining of the present season, and which could not be completed before the cold weather. The annual expence for keeping open the navigation of the Canals, and for preserving the Banks in a state of repair, would be little more than that required for current repairs, and for removing the heavier deposits, such as broken pottery, &c., that might accumulate during the year, and a small deposit of mud in the Entally Canal, as stated by Captain Thomson in the 2nd and 3rd paragraphs of his Letter No. 14, of the 6th instant, copy of which is enclosed.

5th. Adverting to the 5th paragraph of Captain Thomson's Letter above-mentioned, in which he recommends that the present Dredging Boat should be rebuilt at an expence not exceeding 16,000 Rupees, I requested him to state more distinctly his reasons for recommending that measure, and the circumstances under which the repairing of the Boat would prove so great a convenience. Enclosed is copy of his reply, No. 18, of the 17th instant, to which I also beg to annex copy of his "Memorandum of the Steam Dredging Vessel," under date 27th ultimo, which he submitted for the purpose of being referred to on future occasions when the subject may come under discussion, and thus save the trouble and delay of repeated and tedious explanations.

6th. With reference to the improved system of operations which we may expect to see brought into effect on the Conservancy of the Canals being placed under the Superintendent, when the impediments which have hitherto obstructed the navigation of the Balliaghatta Canal will be removed, there can be little doubt, I should think, as to the expediency of rebuilding the Steam Dredging Boat, as proposed by Captain Thomson, on a scale and with a draft of water suitable to the Canals; for, allowing that the Drains were rivetted, as recommended, it will be found, I imagine, that the Canals could be more economically cleared out, and at all times preserved at the proper depth by means of the Dredger than by any other method, and certainly with less public inconvenience and loss to the individuals residing on their Banks.

7th. I therefore beg to recommend that Captain Thomson be directed, in communication with the Superintendent of the Government machinery, to draw up a detailed design and estimate of the probable expence.

8th. With advertence to the Letter alluded to in the concluding paragraph of Captain Thomson's before-mentioned, No. 14, of the 6th instant, which was without date or number, but was, it appears, to have been submitted for the consideration of the Military Board, with a plan and estimate for altering the Drains, I called on that Officer for a regular copy, with such alterations or additions as present circumstances might render necessary, as also the estimate adverted to in that communication, and now beg to enclose a copy of his reply No. 19, of the 17th instant, in which he states his reasons for having withheld the proposition in question; but as this is one on which the efficiency of the Circular and Entallee Canals appears mainly to depend, I beg to recommend that Captain Thomson be directed to submit a detailed report on the subject, in communication with the Board of Conservancy, accompanied by explanatory plans and estimate of the probable expence.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, Colonel,

Superintending Engineer, Lower Provinces.

No. 356. a.

No. 14.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER.

Lower Provinces.

Calcutta: 6th June, 1836

SIR,

I shall now resume the subject of my letter No 4, of the 14th ultimo, namely, a consideration of the best manner of removing and preventing the mud brought into the Canals by the Town Drains.

2nd. The cost of keeping the Circular, Balliaghatta, and Entallee Canals free from mud may be judged of by passed experience. The two last-mentioned Canals have been hitherto dug out every 5 or 6 years at an annual average expence of 3,000 Rupees; and taking the loss of Tolls during that period at nearly as much more, or 2,000 Rupees—(this is exclusive of the probable increase of Tolls in Tolly's Nullah), the annual expence may be rated at 5000 Rs. to keep the Circular Canal of sufficient depth, and was estimated by Colonel Wood's Committee at 8,000 Rupees a year; and, if a Toll had been levied, the loss of it would have been more than one-fourth of the probable collection, as the Canal would have to be dug out every second year; the Circular Canal therefore may be stated at 11,000 Rupees, or 16,000 a year for both Canals. By opening the Lock-Gates, by employing Dredging, and by the construction of the Dhurumtullah Drain Cess-pool, this supposed expence would be reduced to 3,500 for the Circular Canal and 2,000 for the Balliaghatta and Entallee Canals, or 5,500. This is the direct expence, but, if the establishment of the Dredging Boat and interest on the capital expended on it (the Boat) be considered, 8,000 Rupees would be the estimated annual charge, exclusive of establishment and current repairs.

Average annual expence of keeping the Circular Canal free from mud, 11,000.		
Circular Canal, ...	3,500	
Balliaghatta Canal, ..	2,000	
	5,500	
Add establishment of the Dredging Boat, and interest on capital, ...		
	2,500	
	8,000	

3rd. After the proposed drainage of the Banks (now in progress) was completed, and the sides of the Calcutta Drains rivetted and their slopes adjusted, I do not see any adequate cause for expence beyond the current repairs, which may be clearly understood and determined beforehand, including the removal of a deposit in the Entallee Canal from the muddy water, which may probably amount to 2 inches in the year.

4th. The rivetting of the Town Drains from the Circular Road to the Canal, is not only of great importance in preserving the Canal navigable; but as the greater part of the earth washed into the Canal is derived from the Suburbs between the Road and the Canal, a degradation of the surface is now in progress of 300,000 c. ft. in a year, which cannot be replaced, and which will increase the difficulty of draining it and consequently render it more unhealthy every year. A large proportion of these Suburbs, viz. Coomarpura and Bahar Simleah, are 6 feet below the highest rise of the River, and even this height is acquired by the earth which has been thrown up from the numerous Tanks. To rivet the Town Drains on both sides, and replace the Bridges opposite the various houses, would cost 30 or 40,000 Rupees, about one-third of which being the Western Drain of the Circular Road, would be chargeable to the Town of Calcutta. The estimate is reduced to this sum only by making

(a) That on the other side to be one wide Drain on one (a) side of the Road, instead of two filled up. smaller ones on both sides. This is the probable cost of doing the work in a complete manner. It might be done in a temporary and partial way for 5,000 or so; but no plan or estimate can be formed without the co-operation of the Calcutta Conservancy Board. I therefore need not at present say any thing further.

5th. After these improvements to the Drains are executed, a Dredging Boat may not be required on ordinary occasions, but there are circumstances in which it would be a very great convenience; and, judging from past experience, I think these circumstances are likely to occur more frequently than can at present be detailed. Without stating any further reasons for my opinion, I think that the present Dredging Boat should be rebuilt, supposing that the expence did not exceed the 16,000 (b) Rupees. To build a Hand-dredging Vessel of one-fourth the power would cost more money: the engine on board the present Boat has all the moving parts in duplicate, and there is a spare set of brasses for the whole of the machinery, so that it may last, with ordinary care, for 30 or 40 years.

6th. While the dredging remains in its present uncertain state, I do not think that more Receiving Boats (which may last for 10 years) should be built; and, without three times the (c) That is 10 Boats, each holding half a Chowka of earth. present number, (c) the dredging cannot be carried on with energy and economy. I think it therefore of much importance that the plan of future operations should be determined by the Military Board. In the first place, whether the Calcutta Drains will be altered, as proposed; if not, the Dredging Vessel must necessarily be rebuilt; but if so, it is questionable whether the Boat shall be built or not. If it is determined that the Boat be rebuilt, I should, without any further delay, receive authority for building Mud Boats capable of holding five Chowkas of earth.

7th. Accompanying this Letter I have sent in explanation a copy of a Letter (d) written some months ago, but which was not sent, as my communications respecting the Canals were considered by the Military Board so unsatisfactory. It has been forwarded now in its original state, as I have not time to write it again.

I have, &c.,
(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 356. b.

No. 18.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,
Lower Provinces.

Calcutta: 17th June, 1836.

SIR,

As requested in your Letter No. 640, I have the honor to state a few cases in which a Dredging Boat would be a very great convenience, and even so far economical as to cover the expences of it.

2nd. After every means has been adopted to prevent the Calcutta Canals silting up, yet the sliding of the Banks, or the gradual accumulation of broken pottery, or such heavy substances as the current through the Canal cannot remove, will render it so shallow that it must be

either dredged or dug out. Independent of the loss of Tolls by shutting up the Canal to dig it out, the whole of the shops supplied through the Canal with firewood and grain, are deprived for a time of their means of trade, and of course subsistence, and probably of some of their regular customers. The tenant renting a large Wood Bazar in Entallee, the property of the Company, states that he is ruined by the above cause. The report of the Canal being closed, extending to the Upper Provinces, prevents for years afterwards some Boats from coming through it. The high Toll of Tolly's Nullah, with the delays of going through it, besides the dangers of the Lower Sunderbund route, have been undergone on the mere report of the Balliaghatta Canal being closed when only the Entallee portion of it was. These inconveniences would not occur if there was a Dredging Vessel.

3rd. The Bunds to keep the water out of the Canal while it is being dug out, may be afterwards removed with a Box Dredger, such as I successfully used in Tolly's Nullah in January last, so that a Dredging Vessel is not absolutely required for that purpose; but if a Bank was thrown up by the Hoogly, at the mouth of the Circular Canal, or in the Lake Channel, by some of the Cross Nullahs that enter it, there is no possible way of removing these obstructions except by a Dredging Vessel.

4th. The utility of the Dredging Vessel was almost entirely lost in the Nuddea Rivers from her great draft of water; she could not venture into those parts of the Rivers where her services would have been most useful, as by the fall of the River she might have been left aground until a succeeding rains, if not entirely destroyed. The great weight of the vessel,

(a) And a draft of $6\frac{1}{2}$ feet. 280 tons,^(a) was also unfavourable to her utility. With a reduced

(b) As proposed. draft of 3 feet, and a weight of 150 Tons,^(b) the Vessel would be suited to any work likely to be required in India.

5th. A few years ago, there were five or six Hand-dredging Vessels in use, besides the Steam Dredging Boat; the working of these Boats have been stopped more from motives of economy than from the inutility of dredging. I may therefore observe, without presumption, that the same causes exist for keeping up the system of dredging (on an economical scale) that induced the Government to build the Vessel originally.

6th. All that can be done at present is the consideration of the principle of keeping a Dredging Boat to meet such contingencies as I have suggested in this Letter; and, if it should meet your approval and recommendation, then I would draw up a detailed design for the Superintendent of the Government Machinery, and afterwards make out my estimate.

I have, &c.,

(Signed) J. THOMSON, Captain,

Superintendent of Canals.

No. 356. c.

Memorandum of the Steam Dredging Vessel.

27th May, 1836.

The original design of this Boat by Messrs. Bolton and Watt, as far as can be ascertained from their plan, was defective in some respects. The principal error was in having made too little allowance for the displacement of the Boat; the Buckets also appear to have been made heavier than originally designed.

2nd. The error in the displacement arose no doubt from their not being aware, or having neglected to consider, the specific gravity of the wood with which the boat must necessarily have been built in India. This error was at once detected here, and a new design for the Boat had to be drawn up; by this design the breadth was increased from 20 feet to 25 feet,

and the draft of water increased from 4 feet 6 inches to 6 feet 6 inches, or the displacement was increased from 6,000 cubic feet to 10,000 cubic feet. This great increase became necessary not only on account of the saw-wood being heavier than the fir, but the scantling of the whole of the framing was increased more than one-fourth. The weight of the hull and

Estimated weight of Dredging Boat.

	Tons.
Engine, including fly, crank, shaft, &c.	12
Boiler 5, with water 4, and a week's fuel 5, . . .	14
Buckets, chain, lower tumbler, rollers, &c. . . .	6
Connecting machinery, shafts 2, wheelwork with	
upper tumbler 3, ...	5
Plumber blocks and fixed machinery, ...	3
Other machinery unconnected, ...	4
Stores, ...	6
	50

Framing and Hull, ... 230

Total weight, ... Tons 280

framing by the original design was 120 tons, while at present it is 230 tons. I shall be able to show that, with some immaterial changes, the weight can be reduced to the original design, but I believe not below that. The power of the engine appears to be considerably below what it ought to be, principally, I conjecture, from the want of a supply-pump. The reason for the increased weight of the Buckets cannot be conjectured, but from this weight and other causes, it was found that when the machinery was first put together, the engine was incapable of dredging except in the very softest sand : this fact will be the means of forming a pretty correct opinion of the powers of the Dredging Boat—they may be calculated as follows : the weight of the connecting machinery being 11,200 lbs. the friction will be a little more than a fourth or 3,000 lbs., which moved at the average rate of 22 feet per minute, equal to 66,000 lbs., raised one foot high or two horse power. The power of the engine being estimated at 12 H. P., leaves the power, with which the upper tumbler would be turned, 10 H. P. The weight of each Bucket, with bolts, chains and other moving parts, is 4 cwt. ; there are 18 Buckets, and 9 of them being partly filled with 1 cwt. of sand each, gives $4 \times 18 \times 9 = 4$ tons 1 cwt., or 9,000 lbs. The tumbler made 9 turns, or moved at the rate of 72 feet per minute, the friction will therefore be $\frac{33,000 \times 10}{72 \times 9,000}$ or half the weight. To enable the Boat to do work, the rate of motion was reduced in the proportion of nine to five; the power therefore to move the connecting machinery will be as $9 : 5 :: 2 : 1.1$ H. P., leaving 109 H. P. to turn the upper tumbler : of this power turning the Buckets expended $\frac{9,000 \times 40}{2 \times 33,000} =$ H. P. nearly, leaving five horse power to excavate. This power is amply sufficient in ordinary soils, but in very stiff clay the engine is brought up, this is an evil of less importance than that which now occurs ; when logs of wood are caught between the Bucket and ladder, something is either broken or damaged.

3rd. In order to improve this Dredging Boat (with the same machinery,) it is evident that it would be proper to revert to the old rate of working, and reduce proportionally the size of the Buckets, and consequently all the framing, &c. dependant on that weight : also to make the displacement of the Boat what it originally was intended to be, reducing the draft to three feet by increasing the length. Instead of the present enormous mass of timber in the bottom and sides of the Boat, stiffness and strength would be attained by two trussed framings 11 feet high, running the whole length of the Boat. To do the same work, the size of the Buckets would have to be reduced, as the cube roots of the velocities, while the weight would be reduced only as the square roots : nevertheless, as the power required for digging would be reduced in the same proportion as the power required to move the Buckets would be increased, the same effect would be produced nearly by the same power, and the Boat would be more handy and manageable. There are a great many minor improvements which the experience of the present machinery would suggest ; these need not be stated in a short memorandum, but as all the proposed alterations have been subjected to calculation, and to plans and estimates, there is no doubt of their practicability.

4th. The hull of the Boat might be rebuilt, and the machinery altered, for 16,000 Rs.

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

No. 356. d.

No. 19.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 17th June, 1836.

In reply to your Letter No. 638, of the 15th instant, I have the honor to submit for your consideration the plan I proposed adopting for bringing forward the scheme of altering the Drains running into the Circular Canal.

2. When I drafted the Letter, a copy of which I enclosed in my Letter No. 14, of the 6th instant, it was my intention to have drawn up a plan accompanied by an estimate of the expence of altering the Drains in the best manner (in my judgment), leaving it to the Military Board to get the concurrence of the Board of Conservancy—but, as I could not give such a detailed explanation as would meet every possible objection of the Board of Conservancy, and without their concurrence the plan could not be modified, but must have been entirely rejected, I considered it better therefore to get the recognition by the Military Board of the principle of the measure, and to be placed in communication with the Board of Conservancy for the purpose of settling the details: an estimate of the cost could then be made, and the only consideration would be whether the good to be effected is worth the money. The latter way of proceeding, which I have adopted, appeared to me necessary, as the Senior Member of the Board of Conservancy is also a Member of the Military Board.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 357 to No. 360 inclusive, omitted.)

No. 361.

No. 1649.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. SANDERS,

Secretary Military Board.

SIR,

Barrackpore: 30th August, 1836.

Your Letter No. 2048, of the 12th instant, relative to Captain Thomson's proposition for rivetting the Town Drains between the Circular Road and Canal, having been communicated to that Officer, I have the honor to enclose Copy of his reply No. 43, of the 26th idem.

APP. TO APP. H.

2 x

2nd. I perfectly agree with Captain Thomson, as to the importance of the work in question, on which the prosperity of the Circular Canal so much depends, but as it is one which will require much time and consideration, previous to any final arrangements being made for carrying it into effect, I would recommend, that Captain Thomson be directed to proceed with his dredging for the present as if no such project was in contemplation; and which I trust, the Board will enable him to do, by allowing him to repair and fit up the Bhaugiruttee Dredging Boat, as proposed in his Letter No. 40, of the 20th, copy of which I forward to you, with my Letter No. 1646, of this day's date.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, *Colonel,*

Superintending Engineer, Lower Provinces.

No. 361. a.

No. 43.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

Calcutta : 26th August, 1836.

SIR,

In reply to your Letter No. 1431, of the 15th instant, I have the honor to state, that I would have great pleasure in forwarding the estimates of the expence of the works for keeping the Circular Canal free from silt, if it was in my power, but neither the length, breadth, or depth of the Drains, can be decided on by me, and an estimate of the details is consequently quite impracticable.

2nd. Since the opening of the Canal Locks, I consider the proposition for altering the Town Drains, so as to prevent their bringing mud into the Canal, as the most important to the prosperity of the Circular Canal, and I hope you will not suppose that I am exceeding my duty in again urging the consideration of the manner in which this proposition ought to be carried into effect. I wrote to the Board of Conservancy, but received no answer, I would have applied for a Committee if the Board would have abided by their decision.

3rd. If my request cannot be complied with, I have to beg the favor of a reply to that effect, and I could then proceed with the dredging with energy, instead of adopting expedients to save money in the hopes of being able to dispense with it altogether.

I have, &c.,

(Signed) J. THOMSON, *Captain,*

Superintendent of Canals.

(True Copy.)

*

R. TICKELL,

Superintending Engineer, Lower Provinces.

(No. 362 and No. 363 omitted.)

No. 363. b.

Extract—Report of the Committee appointed to consider and Report on which way the provisions of the Act passed by the Supreme Government on the 26th instant, may be most beneficially carried into effect.

“ 32nd. The powers granted by Section V. of the new Act, for the removal of obstructions from the Canals and Tow-paths should, we presume, extend throughout the whole line of the Sunderbund navigation, as far as the Seepsa Khaul Eastward, where Mr. May's jurisdiction (as Superintendent of the navigation of the upper part of the Delta) commences.

“ 33rd. Many of the natural Creeks in the line require Tow-paths more urgently than the Canals; and the clearing away of the jungle on their Banks is now frequently resisted by the Sunderbund Grantees, who leave a belt of jungle for the protection of their Bunds. The Superintendent will of course look to the mutual benefit of the land-owners and the navigators; but it would be well that all grants should specify that the Bank of a navigated Channel should, for a certain breadth, be liable to occupation for the purposes of a Tow-path or public Road.

“ 34th. The Superintendent will likewise require a separate Office Establishment in his executive capacity as follows:—

“ One Writer, two Jemadars, 10 Peons and three Dingees: the Peons to be stationed, or to range along the whole line of the Canal for the protection of the works and maintenance of order, and to bring Reports to the Superintendent, &c. The estimated charge for this small Establishment is 96 Rupees, as per Appendix F.

“ 35th. Having now disposed of all questions touching the collections and supervision, we will briefly allude to the subject of repairs and improvements, to which our notice is likewise directed by Mr. Secretary Mangles. These will doubtless be brought forward as occasion may demand, and with all the requisite arguments and information by the Superintendent through the regular channel of the Superintending Engineer, nevertheless we may safely venture to place before your Lordship a few of the most prominent wants and improvements that suggest themselves to us.

“ 36th. The amount of the annual expenditure to keep the Canals in working order, including the salary of the Superintendent, may be taken at 30,000 Rupees, leaving full double that amount available for extra works: so that there need be no delay in settling about such as appear the most useful.

“ Of these we may enumerate:—

“ 1. The construction of an Iron Dredging Boat, to contain the Steam Dredging Machine on a new plan, so as to draw less water and occupy less space in breadth. The present Boats have been some time condemned and dismantled. The estimate for the new Boat is Rupees 25,000.

“ 2. The general repair of the Tow-paths, and the bridging of Cuts made for irrigation in various places. Such works cannot be exactly estimated without a full examination of the whole line: nor should they perhaps be included in the present catalogue, being of an ordinary and indispensable nature.

“ 3. The bunding of the Gobra Khall, which will afford the means of scouring the Baleygunge and Bhowanipore Canals, now liable to be filled up by cross tides. It will be remembered that an attempt to bund the Kalloar Gong with the same object failed after an outlay of 20,000 Rupees: but the mode proposed by Captain Thomson, of applying a chain to the support of the temporary resisting screen, appears to be highly judicious and calculated to ensure success, while the whole cost is not estimated at above 6,000 Rupees.

" 37th. The above we consider to be almost indispensable works. The following we look upon as great improvements.

" 4. Rivetting the Main Drains leading from the Circular Road to the Canal, so as to prevent the washing in of a large quantity of silt. To do this effectually to all the principal Drains would cost 40,000 Rupees, but more accurate estimates would need to be called for, and other material considerations regarding the Drainage of the Suburbs and of the City would require due attention.

" 5. The widening of the Balyaghaut Canal, from the junction of the Circular Canal to the extent of twenty feet, would involve the destruction of the Road on the South of the present Canal, and would cost about 18,000 Rupees. If thought necessary to purchase ground for the construction of a new Road, the price may be calculated at 500 Rupees per Beegah, for 60 Beegahs, say Rupees 30,000, and the making of a kucha Road on the same would come to Rupees 2,500. This work would require more careful estimation, but in our opinion it would much facilitate the navigation to equalize the breadth of the Balyaghaut to that of the Circular Canal.

" 6. The excavation of a Basin at the upper end of the Lake capable of holding say 500 Boats, is also a very desirable object, and we recommend that the Superintendent should be directed to prepare plans for the same; including a Lock-Gate to retain water in it. We may state the probable expence at not less than 30,000 Rupees.

" 7. The closing up of Kamkera Khaul, which now Drains a large Jheel and inundated tract into Tolly's Nullah, causing a bar of sand to be formed at its entrance, is also a desirable improvement for Tolly's Nullah. The principal cost would arise from the necessity of providing Sluices for the admission and discharge of the water elsewhere; the amount may be stated at 7,500 Rupees.

" 8. Connected with the same Canal may be mentioned the Dredging out one mile in length to the depth of three feet below low-water mark, which would cost Rupees 15,000.

" 38th. These estimates are all made in the roughest manner, and are only introduced to assist in guiding Your Lordship's judgment as to which of the proposed works should be first put in hand. The whole would apparently involve an outlay of 1,60,000 Rupees, and consequently would absorb the accumulated surplus of about three years.

" 39th. We will not detain the present Report to enter more particularly into the merits of each work, but we strongly recommend, that the Steam Dredging Boat should be put in hand without delay, as the Circular Canal, and its continuation the Balyaghata, will in a few seasons be rendered unprofitable without such means of clearing out the rapid deposit from the City Drains."

(No. 364 to No. 368 inclusive, omitted.)

No. 369.

No. 83.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta: 5th December, 1836.

The Board are, I believe, well acquainted with the situation and the extent of the navigation of the Kamapookerya Khaul, which runs into Tolly's Nullah—up to the 1st November last, a Toll House was situated at the Village of Kamapookerya, which collected from every loaded Boat or Saltee that passed, four Annas, the produce of this Toll has been esti-

mated at from 10,000 to 8,000 Sicca Rs. a year, making 32,000 loaded Boats a year, or about 500,000 maunds of grain and straw. There may be about 150 Boats employed in this traffic, 20 of which exceed 25 maunds burthen, by the present rule of measurement, and as these Boats have not entered Tolly's Nullah by passing either of the Toll Houses, I cannot distinguish between these Boats (which have not tickets) and those which have entered the Canal without paying. The Kamapookerya Khaul has no navigable communication with either the Hoogly River or the Sunderbunds, it may therefore be considered as part of Tolly's Nullah, and the Boats remaining in it, and navigating within it and Tolly's Nullah, are chargeable with rent. If the Board concur in this opinion I will make the collection from the 1st instant.

I have the honor to be,

Sir,

Your most obedient Servant.

J. THOMSON, *Captain,*

Superintendent of Canals

No. 370

No. 4534

To CAPTAIN J. THOMSON,

Superintendent of Tolls.

SIR,

20th December, 1836.

I am directed by the Military Board to acknowledge the receipt of your Letter No. 83, of the 5th instant, and to request you will furnish information on the following points, viz. :

First. In what manner the Boats belonging to the Kamapookerya Khaul can be distinguished from others, which navigate the Tolly's Nullah, and how you propose to levy rent on the former ?

Secondly. Whether there is any objection to levying a Toll on the Boats passing out of this Khaul, and whether a Toll House might not be advantageously erected at the mouth of the Khaul, and the same amount of Toll levied on the Boats frequenting it, as at the Toll Houses situated at the ends of the Nullah.

I have, &c.,

E. SANDERS,

Secretary Military Board.

No. 371.

No. 100.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 23rd December, 1836.

In reply to your Letter No. 4534, of the 20th December, I have the honor to state, that Boats belonging to the Kamapookerya Nullah cannot be distinguished from other Boats, but not having tickets I propose to apply the same rule to them as to any other Boat found in the Canal without a ticket, that is, to send it to the nearest Toll House to have the ticket renewed if it has been lost, or another one granted on the payment of Toll if the Boat has entered without payment. If the Boats refuse to show their tickets, I have the power of antedating the renewed one a month, which is equivalent to a fine of 4 Rupees

per 100 maunds burthen : it is therefore the interest of the Boat people to pay the rent regularly, or what comes to exactly the same thing, renew their tickets every 8 or 9 days. With reference to the second question I have to reply, that the expence of making a collection at the mouth of the Nullah, would be greater than the Toll collected, besides the Act would have to be altered to allow of another Toll House being erected. The object, which I propose to attain in collecting rent from these Boats is, that no Boat ought to be found in the Canal without a ticket, otherwise I have no check on the collection, as any Manjec of a Boat may tell me that his Boat belongs to the Kamapookerya Khaul if such Boats are made an exception.

I have the honor to be,

Sir,

Your most obedient Servant,

J THOMSON, *Captain,*

Superintendent of Canals

No. 372.

No. 4789.

To CAPTAIN J. THOMSON,

Superintendent of Tolls.

SIR,

6th January, 1837.

With reference to your Letter No. 100, of the 23rd ultimo, I am directed by the Military Board to request you will state how far the rent you propose to levy will affect the proprietors of Boats in the Kamapookerya Khaul, and whether the Toll formerly charged on these Boats or the rent now proposed to be levied will give the higher amount.

I have, &c.,

E. SANDERS,

Secretary Military Board.

No. 373.

No. 115.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 14th January, 1837.

In reply to your Letter No. 4789, of the 8th instant, I have the honor to Report, that as 9-10ths of the traffic in the Kamapookerya Khaul is carried on in Salties or Boats under 25 maunds burthen, the few Boats in excess of this burthen will be driven out of the trade, as since my last Letter on this subject not a single Boat exceeding 25 maunds has come out of the Nullah.

2. Judging from the number of Salties and Canoes passing through this Nullah, and the Toll of 4 annas formerly leviable on each of them, about 10,000 Rs. a year must have been received from them. There will now be nothing.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 374 to No. 379 inclusive, omitted.)

No. 380.

No. 73.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals.

TO THE SECRETARY MILITARY BOARD.

Calcutta : 29th November, 1836

SIR,

At the request of the petitioners I have the honor to forward the petition of a number of merchants residing near Tolly's Nullah. This petition states all the grievances which they say arise from the change in the system of collecting the Tolls on the Canals. The substance of their petition is, that the old plan of collecting the Tolls be again adopted, which of course cannot be granted them, their statement that they pay more Toll now than they did formerly, is probably correct, as the amount of cash received now is 50 per cent. more than formerly, but their assertion that the imports this month are much less than usual is incorrect, as the number of loaded Boats entering have greatly increased in the proportion of three to two, but they appear of a smaller size. It is probable therefore, that the proprietors of a large number of Boats are keeping them back, until they can devise some mode of evading the Tolls. Any of the proposals in their petition (if adopted) would open a door to bribery and other abuses.

2. There is a complaint very general among the proprietors of a large number of Boats (and also referred to in this petition), that the proprietors have no check on the charges made on them by their Manjees for Toll: the tickets or receipts for the Toll given to the Manjees being taken from them on their going out of the Canal. These proprietors might be left to make their own arrangements if it was not their interest to make an agreement with the Toll-keepers, which would end in bribing them. The project has been agitated of registering all Boats, if this plan was adopted by the large proprietors before-mentioned, I could grant them weekly or monthly a receipt for all the Tolls paid by them, which would not only be a check between them and their Manjees, but also between the Toll-keepers and me. The premium I would propose to hold out to those registering their Boats would be, that they would be permitted to pay their Tolls weekly direct into my office, the Toll-keepers being authorized to grant passes to all Boats properly marked and registered, on the note of hand of the Manjee.

3. All that is necessary to be done before this proposition can be adopted is, that the opinions of those most interested be ascertained to the satisfaction of Government.

I have the honor to be,

Sir,

Your most obedient Servant,
 J. THOMSON, *Captain,*
Superintendent of Canals.

(No. 381 to No. 390 inclusive, omitted.)

clxxx

No. 390½.

No. 120.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta : 7th February, 1837.

SIR,

I have the honor to forward the statement of the money collected on the Canals during the month of January last. A considerable sum of money appears to be in the hands of the Toll-keepers, but this was unavoidable; as about the end of the month the Boats with pilgrims began to arrive, and 300 or 400 Rupees a day was collected at each of the two Eastern Chowkies, and it required some arrangement to have in hand such a small sum as 2,000 Rupees.

It will be superfluous for me to report monthly the supposed cause of variations in the amount of collections made. I have herewith added a table of rate or ratio of the monthly collection for an annual collection of 1,000 Rupees. This rate is taken from the average collections of the last 10 years.

	Monthly ratio.	Collected.	Probable annual collection
January, ...	100 ..	19,700 ..	1,97,000
February, ...	120		
March, ...	125		
April, ...	115		
May, ...	65		
June, ...	65		
July, ...	60		
August, ...	60		
September, ...	65		
October, ...	70		
November, ...	75 ..	15,700 ..	2,09,000
December, ...	80 ..	17,100 ..	2,14,000

1,000

The three months collected will, according to this scale, give an annual collection of two Lacs. The monthly collection being divided by the monthly ratio will show the probable annual Jumma.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*
Superintendent of Canals.

No. 391.

No. 5635.

FROM THE SECRETARY TO THE MILITARY BOARD.

To CAPTAIN J. THOMSON,
Superintendent of Canals.

Dated 10th February, 1837

SIR,

I am directed by the Military Board to request you will inform them, what, in your opinion, would be the probable effect on Tolly's Nullah if the navigation from the Hooghly to the Kidderpore Bridge were declared free, and if the Toll House were removed to the north of this Bridge.

2. Also what would be the probable effect if the navigation were thrown open as far as the Allipore Bridge.

3. Or, if in either case instead of making the navigation perfectly free, a second Toll House were built, and the Toll exacted on this portion of the line limited to one-fourth the total rate.

4. The subjects of consideration in such case are—

1st. The convenience of the Public.

2nd. The state of navigation of this part of the Nullah, which such a system of things would induce.

3rd. The interests of Government, as far as the collection of Toll is concerned.

4th. Its influence on the value of landed property on the Banks of the Nullah.

5th. The Board are also desirous of learning whether in your opinion, in the event of any change being effected, it would be better to admit of different rates of Tollage on this portion of the Canal having the amount determined by the distance travelled or at once to diminish the Toll exacted along the whole line one-half or by one-fourth.

6th. Further, you are requested to state if you think any part of Tolly's Nullah might with convenience be declared free, if so, to what spot such freedom of navigation might extend, and the sacrifice or probable sacrifice Government would make thereby.

7th. In your monthly Report of collections for January, the Board remark a sum of Rs. 3,513-3-0, received at Kidderpore. The Board desire to know what proportion of that amount was derived from the Coal Dépôt of Messrs. Carr Tagore and Co., as well as the number of Boats that passed the Panchpotah [Panspottah] Chokey, after having paid Toll at Kidderpore.

8th. If in your power to give the subject immediate attention, the Board request you will favour them with an early reply.

I am, &c.,

(Signed) E. SANDERS,
Secretary Military Board

No. 392.

No. 123.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 20th February, 1837.

An early reply being required to your Letter No. 5635, of the 10th instant, I have the honor to state in reply to each paragraph in detail.

2. If the navigation of Tolly's Nullah, from the Hoogly to the Kidderpore Bridge, were declared free, it would be necessary to state some preamble or reason for the change which would be equally applicable to the other four Toll Houses, but as a similar indulgence could not be granted in all these cases, it might cause more dissatisfaction than the benefit likely to arise from the change. The loss of Tolls to Government would be about 1000 or 1500 Rupees in the year, without any benefit to any one except the proprietors of the ground, who could charge a greater rent. The mouth of the Nullah would be made use of as a dock for empty Boats, these might no doubt be summarily removed, but an order to effect this would cause as much obstruction to the navigation as permitting them to remain. I have stated, that if the Toll House were removed to Kidderpore Bridge, that the proprietors of Kydgunge would be benefited to the extent of the difference of Toll nearly in the rent of the land, but this would be only in the single case where the ground was rented for storing articles brought from the Hoogly, and to be again taken into the Hoogly for expenditure, and coals appear to me to be the only description of goods to which this is applicable. I am informed that Messrs. Carr, Tagore and Co. are making arrangements for removing their Depôt from Tolly's Nullah, whether any alteration in the Toll takes place or not—and the ground will probably never be used as a Coal Depôt again.

3. The foregoing remarks are also applicable to the second proposition of placing the Toll House at Allypore Bridge, with the addition, that as all (4.5ths) the grain, straw, firewood, vegetables, fruit, fowls, &c., (with the exception of earthenware) come from the Eastward of Allypore Bridge, the Orphan Bazar could be cut off from all country supply, and must pay the Hoogly (that is the Calcutta) prices for every thing.

4. The third proposal of collecting a reduced Toll at the mouth of the Nullah would involve an expence of double or treble the probable amount of collection, and render it necessary to stop every Boat three times instead of twice: other practical difficulties probably exist, as I do not see clearly how the details are to be arranged: my Office business would be increased one-half more.

5. My reply to the five subjects of consideration, stated in the 4th paragraph, is, to the 1st,—The public must be inconvenienced by any change even for the better; but from simplicity to complication much more so. 2nd,—Making the navigation free communicating with the Hoogly, would place the Nullah in the same situation as that of the Hoogly: the navigation would be stopped by Boats lying there. Any order to remove them would be an order for the exaction of a fee to the public for permission to remain: no system of passes or rent could be applied for reasons stated in the 4th paragraph of this letter. 3rd,—The interests of the Government will not in the least degree be interfered with. The large collections that have been made show, that the Government can get any sum they consider reasonable, although they may give up the Tolls to the Westward of Allypore Bridge, or any limited distance. 4th,—With the exception of the coal sheds, the proposed change would have no influence on the value of land on the Banks of the Nullah. The ground is too distant to be used for warehousing European goods, and it is already occupied by bazars and stores for country goods, the greater part of which come from the Eastward. 5th,—Any reduction which it

may be considered proper to make in the amount of Toll proposed to be collected should, for reasons before stated, be made on the burthen of the Boat on the whole navigation, and not by any partial exception of a portion of the navigation ; in the first case the public would benefit by the reduction, in the second case only a few individuals.

6. The number of Boats that entered Tolly's Nullah at Kidderpore during the month of January, was 1260, having a burthen of 3,48,950 maunds—of these 562, burthen 2,06,300 maunds, passed out at Panspottah, and about 1,00,000 maunds returned into the Hoogly. I am informed that these latter went into the Nullah partially loaded and returned with freights of firewood and grain for the supply of those residing on the Banks of the Hoogly.

7. Messrs. Carr, Tagore and Co. brought no coals into the Nullah, and I believe carried none out by Boats. I have no returns, but am told that they loaded some Boats in the River from their Dépôt by land carriage.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 393 and No. 394 omitted.)

No. 394 $\frac{1}{2}$.

No. 73.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta : 11th March, 1836.

In reply to your letter No. 4,065, of the 9th instant, I have the honor to state, that my Bill No. 20, dated 1st September, 1835, included the whole of the expence of the work sanctioned by Government on the 29th September 1834, as referred to in your letter. The whole of the work intended to have been executed was *certainly not completed*, as the rains set in before it was done ; however, as the jungle grows every rains, and the Tow-paths are also cut through to drain the lands, the work would have to be sanctioned every year, and the accounts closed in June.

2nd. The gang of Dangur coolies hired at the beginning of the season, were unable to complete the work as expected, in consequence of much extra work having arisen from the Banks of the Choumook, near Chytul, and of the Dhausa Khal, near Hussainabad, having fallen.

3rd. No preparation has been made for continuing this work, nor has it been recommended to be continued, although the utility of it is undoubted, in consequence of my not having any authority to cut down trees or jungle, or make Embankments.

I have, &c.,

(Signed) J. THOMSON, *Captain.*

Superintendent of Canals.

(True Copy.)

J. A. CROMMELIN, *Captain,*

For COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces.

(No. 395 and No. 396 omitted.)

No. 397.

No. 131.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta: 8th March, 1837.

SIR,

In reply to your Letter No. 6,077, of the 3rd instant, on the subject of the proposed Docks for Boats at the Salt Water Lake, I have the honor to request that the plan of proposed Docks be returned to me, with the specific alterations required to be made and marked on the face of it.

2nd. The Section of the Docks is the same as that of the Circular Canal, which has been found convenient, and as the average of large Boats occupy a space along each Bank of 50 feet, 25 feet in length of the Canal has been allowed for each Boat: when the Boats are lying along each Bank, there will be a passage of 25 feet wide in the centre, but the Boatmen will probably prefer tying their Boats with the bows towards one of the Banks, in this case each Boat will occupy 25 feet of the Bank, but there will be only one line of them in each Canal.

3rd. The situation of the proposed Docks is between Mr. Prinsep's salt-works and the Lake Channel, as may be seen by a reference to the printed Map of the Salt Water Lake, in the Military Board's Office. The Docks will be rather favourable to the manufacture of salt, and Mr. Prinsep may draw his supply of water from the Docks or not as he pleases.

4th. To excavate the Docks in any other situation than the Lake, will increase the cost enormously, the digging and the quantity of ground covered will, exclusive of the higher price of the land, increase the expence about twenty times. The Banks or the sides of the Docks would also be too high, which is a great inconvenience in loading and unloading goods. The price of the Locks would be the same in both cases. The carriage of the goods between the Docks and Calcutta would necessarily be by water if there were easy access to the Docks by a pukka Road. The Road must be kept in repair at an expence of 3 to 5,000 Rupees a year. The goods would be carried as they now are, by small Boats from the large ones now lying in the Lake Channel. The Lake Channel is now lined with Boats for two miles.

5th. The deeper the water at the entrance of the Docks the more useful they would be, but any situation in the Lake more to the eastward or southward than the present one, has the insuperable objection of want of good drinking water and of a Bazar.

(True Copies.)

EDWD. SANDERS,
Secretary Military Board.

(No. 398 and No. 399 omitted.)

No. 399. *a.*

No. 25

FROM CAPTAIN JOHN THOMSON.

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

Calcutta : 16th July, 1836.

SIR,

On my return from visiting the Sunderbund Canals, I have the honor to report their state, with reference generally to such changes as appear to have taken place during the past year.

2nd. The Embankment made on the Northern side of the West end of this Channel has improved the navigation to an extent exceeding my expectations. Lake Channel. The communication with the NE. Lake is widening and deepening daily, and already there is 18 inches more water at low-tide in the Balliaghatta Canal than at any former period; the head of the Lake Channel is also 2 feet 6 inches or 2 feet 9 inches deeper from this cause, combined with the Dredging. These improvements are likely to be permanent: an unexpected advantage also has arisen from this work; the NE. Lake has an average level more than one foot below the high-water mark of the Channel, in consequence of this, the current runs up the Lake Channel for an hour after high-water, and permits the largest descriptions of Boats to come up and enter the Canal, being further assisted by the Tow-path on the other side of the Channel. Only 2 large Boats have been lost in this Channel during the last eight months: from 2 to 3 per month was the usual number lost formerly. To these improvements and the opening of the Chitpore Locks, I principally attribute the great increase of Tolls in this Canal during the latter part of the past year: comparing month with month, the Tolls have been more than trebled.

3rd. Nearly one-half of the Tow-path between the Tarda Nullah and this Canal has been destroyed, and become impassable from Cuts made through it by the fishermen; which Cuts have been widened and deepened by the Boatmen passing over them. This was a most useful Tracking-path, and should be renewed, although the expence will be double that of the original cost of making it. Bhaminghatta Canal.

4th. No change has taken place in this Canal, but the Tow-path of the Biddadhurree has been cut in three places, and the jungle is encroaching on the Channel. Bhojediggee Canal.

5th. This Canal is about 5 feet deep at each end, and 4 feet in the middle at high-water neap-tides. The soil through which this Canal is cut is bad, and the sand which falls from the sides, is the cause of its filling up. As Chaltaburya Canal. I cannot propose any permanent remedy for preserving the Canal navigable, it must be cleaned out, and the sooner it is done the more economical the work will be; but I will be unable to give any attention to it next year.

6th. The Tow-path on the West Bank of the Choumook, Bussera, having fallen into the Nullah, and the edge of the Bank being occupied by houses and piles of firewood, the new path will be made on the East Bank. The mangrove jungle is encroaching on the Choital Canal. Choital Canal.

7th. These two Canals are becoming shallower every year by the sliding of the sands from the sides, they will probably be entirely closed in two years more. The only way of deepening these Canals and permanently Bhowanypore and Bsy-leygunge Canal.

preserving them navigable would be, by damming up the Gobra Khaul. The quantity of water passing through each of these Canals when full, is about 200 cubic feet of water in a second; there runs in the Gobra Khaul about 12,000 cubic feet in a second, and, having its origin in a Lake, it would no doubt give a sufficient scour to deepen and preserve in future these Canals navigable. As Lieutenant Schalch and Captain Prinsep have fully stated the advantages and even necessity of this measure, I need say nothing further about the expediency of it; but the practicability is questionable. Captain Prinsep estimated the cost of damming up the Kulowar Gong (the same size as the Gobra Khaul) at 10,000 Rupees, he expended nearly 20,000 and failed (the particulars may be seen in his report). This shows the difficulty attending such a work; much consideration was given to the best manner of damming up Nullahs by the Committee on the Draining of the Salt Water Lake, of which I was a Member, and I have had some experience (although not very successful) in this kind of work, I therefore think the work practicable, and for a comparatively small sum of money, 3 or 4,000 Rupees. The Natives successfully dam up large Nullahs (100 feet $\times$ 15 feet) for 5 or 600 Rupees. If the Military Board approve of the proposition, I will make enquiries into the particulars of the present case, and frame an estimate.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 400 to No. 402 inclusive, omitted.)

No. 402. a.

No. 45.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,
Lower Provinces.

Calcutta: 29th August, 1836.

SIR,

I have the honor to forward the Estimate for Damming up the Gobra Khaul called for in your Letter No. 1168, dated 26th July, 5th paragraph. Being conscious of the difficulty of execution and risk of failure of the work, I consider it necessary to detail the manner of executing the work, my reasons for so doing, as well as the cost, for the consideration of the Military Board, not for the purpose of getting rid of the responsibility, but to give as much as possible, a confidence in my capability of executing the work.

2nd. Captain Prinsep attributed his failure firstly to the bad soil, which was so soft that the water swept it away as fast as it was thrown in, and no progress was made until he arrived at the stiff yellow clay, found every where in the Sunderbunds at various depths, of from four to six feet. This is a very general complaint, but I have overcome the difficulty by digging and heaping up the earth required for the work before-hand; by this means, the good clay is on the top and first used for the foundations of the Dam; besides which, when the soft black mud has become dry, it hardens and absorbs water very slowly, and is not readily washed away unless disturbed. The second cause to which failure was attributed, was that the piles driven to a depth of five feet, were not strong enough, but ought to have been driven ten feet deep. The calculated greatest figure on each pile acting four

feet from the top is one ton three cwt., so that if the pile was secured at top, one foot in the ground would be sufficient. It is proposed to drive them five feet, and secure the top by an iron chain secured at each end by anchors and piles; when the piles are driven, a temporary Bridge will be made over the Nullah to enable me to commence in the middle, and keep the Dam of an equal height throughout the whole length.

3rd. The Lot No. LXXXIX, adjoining the work, is cleared, so that the workmen can live on the spot; and as I intend to supply them with food and water in addition to the usual pay, I trust I shall be able to secure them against the sickness which was so destructive on the former occasion.

4th. The only cause of failure not noticed, is the want of workmen: when the earth has been dug, the piles driven, and the fascines and gabions made, 800 men could complete the work in two days; if the workmen cannot be got, the completion can be deferred for a few months, or even a year, without any inconvenience or material loss.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copies.)

R. TICKELL.
Superintending Engineer, Lower Provinces.

No. 402. *b.*

No. 54.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,
Lower Provinces.

Calcutta: 19th September, 1836.

SIR,

With reference to my Letter No. 45, dated 29th August 1836, on the subject of Damming up the Gobra Khaul, I have the honor to forward some references (at the end of this Letter) to report on the subject. I cannot judge how far these papers will elucidate the subject, but, independent of them, will endeavour to place in as clear a light as I can, the merits of the question. In Captain Schalch's original project for Canals he proposed to carry the Cut from the Juboonah to the Chaumook in one Canal, and any of the Nullahs which would cross his line were to be dammed up. To have proposed such a plan, I suppose he must have been unacquainted with the existence (as appears by his plan) of the large Channels which crossed his proposed line; Captain Schalch did not open the Hussainabad Canal; and when Captain Prinsep proposed doing it, there was a great outcry about admitting the salt water into the Juboonah, and the fresh water into the salt manufacturing districts. There was no ground for alarm on either of these suppositions, as the Juboonah joins the Roymungul only 7 miles below the Canal, the width of the Salt Water Creek being twice that of the Juboonah, and twenty times that of the Canal; nevertheless to meet the wishes of all parties, it was agreed to Dam up the Kuloargong. Captain Prinsep approved of the measure, as it would throw a strong current through the Baileygunge Canal, which was even at that time fast filling up with sand. The cause of the failure of the Dam I have considered in my former Letter.

2nd. The cause of the filling up of the Baileygunge, Bhowanypore, and some of the other Canals was supposed by many at that time to be the meeting of the tides in the Canals. By

the meeting of the tides, I mean still water during the ebb or flood ; such an occurrence never happens ; I need not therefore endeavour to show that it is impossible. The existence of this erroneous supposition has up to the present time prevented any measures being taken to preserve the Baileygunge and Bhowanypore Canals navigable. The true cause of the filling up of these Canals is the nature of the soils of which the Banks are formed, viz. a running sand. Captain Prinsep reported the depth of that sand to be nine feet below the surface, or seven feet below high-water neap-tides of the dry season. In paragraph 20th of my Report, dated 1st May 1834, I have given a section of the Bhowanypore Canal, with some observations on the cause of the silting up of this Canal. The quantity of sand that will run into the Canal is, in many places, limited and exhausted already ; and if the Banks were drained and artificial means were used in some of the worst places to protect the Bank, the Canal might be deepened with the hope of its remaining permanent.

3rd. The mangrove and some other kinds of shrubs protect the Banks of the Sunderbund Channels from the effects of the currents, but these shrubs will not grow in sand : but as the sand is washed out of the Canal, the clay Banks fall in and the mangrove thrives very well ; this is the situation of about one-fifth of the Banks of these Canals, which are crossed by beds of sand. The water of the Sunderbunds deposits on the sides of the Channels a soft black mud, favourable to the growth of the mangrove, and if this mud (in the Canals in question) was not disturbed by the water oozing through the Banks from the marshy land on each side of the Canals, the mangrove jungle would soon form permanent Banks ; a few Cuts through the Banks of the Canal would Drain the marshes now behind them, also Banks of puddle would keep the sand out of the Canal ; but at present I have doubts of the practicability of executing these.

4th. By closing up the Gobra Khaul the Baileygunge Canal will be much more benefited than the Bhowanypore Canal ; the former is less obstructed than the latter, and is connected with a larger Channel, besides the general slope of the Sunderbund at that place is SE., and the direction of the Canals is nearly NE. and SW. ; notwithstanding these disadvantages, I expect that there will be sufficient water through the Bhowanypore Canal to keep it open. From the position of this latter Canal, I anticipate that the ebb will run through it much stronger than the flood ; this will be advantageous for several reasons.

I have, &c.,

(Signed) JOHN THOMSON, *Captain,*
Superintendent of Canals.

References to Reports and Letters on damming up the Sunderbund Channel, West from Hussainabad.

Remarks by Captain Schaleh, (without heading or date) respecting the Kulloar Gong, &c., between the 3rd and 11th February, 1824.

Captain Prinsep's Letter No. 2, 26th October, 1826, paragraphs 9 and 12.

Ditto ditto ditto, No. 17, 20th January, 1827, paragraph 3rd.

Report with Letter No. 66, 28th August, 1827. Headed Bayleygunge Canal, Kulloar Dam, proposed Scheme, &c., paragraph 2.

Letter No. 112, 3rd May, 1828.

Ditto No. 119, 30th May, 1828.

Report with Letter No. 130, 22nd August, 1828, under head Kulloar Dam.

(True Copy.)

R. TICKELL,
Superintending Engineer, Lower Provinces.

(No. 403 omitted.)

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No. 403. a.

No. 60.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 24th September, 1836.

I have the honor to forward an explanation of what I presume to be the cause of the current running up the Lake Channel for an hour after high-water, as called for in the 2nd paragraph of your letter No. 1879, of the 17th instant.

2. The artificial Channel marked (A.) in the sketch is the only communication which the North-Eastern portion of the Salt Water Lake has with the Lake Channel. The mean level of this part of the Lake will remain nearly the same, whatever may be the size of the opening admitting the tides. I shall suppose that in the dry season the mean level of this part of the Lake is—1.3, high-water—0.6, and low-water—2. The high-water on the entrance Channel being + 0.3, and the low-water—5.6* According to these levels, which are nearly correct, I have made a diagram showing the heights of the tide in the North-East Lake and in the Lake Channel, with the hours of the day, which shows that if the high-water is at 6 o'clock it will continue to run into the North-East Lake until 7, and afterwards run from the Lake into the Channel until 3, when the two tides are again on the same level. The section of the entrance (A.) is about the same as the Lake Channel, and it has sufficient influence therefore on the latter to affect the current for at least one mile down.

3. Formerly the levels and tides did not essentially differ from what they are now, but the very small section of the entrance (A.) could not apparently influence the current in the Lake Channel. The levels and currents are modified about the time of high-water by the tides admitted from the Hoogly by the Canal, the effects of which are shown by the dotted line. To have noticed these latter tides more particularly, would have rendered the subject too intricate.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

* Supposing the influence of the Canal removed—from any Tide Table was made beyond the influence of the Canal.

No. 404.

No. 3340.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

With reference to your Letter No. 2027, dated 27th ultimo, I am directed by the Military Board to request you will call [on Capt] J. Thomson, Superintendent of Canals, for a section of the Gobra Khaul, and of plan and section of the Dam he purposes to construct, also a sketch on a small scale including the Khaul and the Ballygunge and Bhowanypore Canals, with a report, and distinctly showing the advantage he expects from the execution of this work.

I have, &c.,

MILITARY BOARD OFFICE :

25th October, 1836.

(Signed) E. SANDERS,

Secretary Military Board.

No. 405.

No. 122.

FROM CAPTAIN J. THOMSON,
Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

SIR,

Calcutta: 18th February, 1837.

I have the honor to make the following Report on the lands on the Banks of the Circular Canal.

2. The quantity of land on the West Bank is about 129 B. 13 C., of which 91 B. 5 C. are let at a rental of 1,820 Rs. per annum; on the East Bank the quantity is about 148 B., and 15 B. 2 C. may be added in consequence of the width of the Road having been reduced from 70 to 50 feet: of the first quantity of ground, 148 B. 14 C., there is 110 rented at 906 Rs. per annum, the average of the West Bank being 20 Rs. and of the East Bank 9 Rs. I have separated each Bank into divisions, having reference to their position being near or distant from the Bridges. The East Bank is affected more by this position than the West Bank, but the rates of rent of both Banks are more dependent on other causes than their situation with reference to the Bridges. The rates near Manicktullah Bridge, and to the North of it, are very much depressed without any ascertainable cause.

3. The following is the result of my enquiries respecting the value of land in the vicinity of the Circular Canal. If a bazar has been successfully established, the rent will give a return of 200 Rs. per Beegah—100 Rs. of which is a return for the capital invested, and there is a very great risk in the attempt to establish a bazar and to keep one up. The consequence is, that no one would expend capital on vacant land without a lease of at least 20 years. The other purpose to which the lands may be applied is that of Warehouses—ground thus applicable will rent for 70 or 80 Rs., one-third of this will be due for invested capital and risk, and for such a purpose a long lease would also be requisite. Ground with huts lets for 24 Rs., and ground fit for cultivation at 6 Rs. per Beegah. I believe the present ground rent to be high, and propose that the terms of letting should be as follows: The upset price of the West Bank, and within 100 yards of the Bridges on the East Bank, to be 16 Rs., and the rest of the land 8 Rs.,—that the lease be for 5 years, but the tenants have the power of renewing their lease every 5 years, on payment of a premium of one quarter's rent. The leases to terminate at the end of 20 years. The offers to rent land to be put up to public auction. When a lease is thrown up, the tenant to receive the price (at 12 years' purchase of the nett returns) of any pukka building or other permanent improvement on the ground, which improvement may have received the sanction and approval of the Superintendent of Canals. Machinery requiring care and attention, or perishable articles of any kind, would not be considered as permanent improvements.

4. Parties offering 60 Rs. per beegah or more, to receive the lease of the land without their offer being put up to auction. Those lots for which no offers may be made at the upset price to be let from year to year to the highest bidder, the rent to be paid in advance on the lot being knocked down to the party; this lease may be cancelled at any time during the year, on re-payment for such portion of the year as may have to run, and the payment of the assessed value of crops on any other immovable property on the ground.

5. It would be very desirable that these conditions, or others which the Board may approve of, be published early in March, (before the 5th) by which time I shall have prepared lithographed plans of the lots, and would receive offers up to the 1st April, on the 3rd or 4th of which month the offers would be put up to auction.

6. I have further to request permission to sell (with the final confirmation of the Board) any small lots or portions of ground conveniently situated for parties holding ground in the vicinity.

7. When the lots have been leased out, I intend proposing that tenders be advertized for offers for collecting the rent. I could probably get it done for 15 per cent., the former being guarantee for all defaulters, &c.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, Captain,

Superintendent of Canals.

No. 405. a.

East Bank.

Rates at which the Ground is let on the Circular Canal Banks.

Situation.	Average.	Maximum.	Minimum	Lot.
From Junction, ...	11 8 4	75 0 0	3 8 0	2 to 12
Ballecaghatta, ...				
500 Yards, ...				
Intermediate, ...	20 0 0	20 0 0	0 0 0	14 to 24
500 Yards, ...				
Narculdangah, ...				
500 Yards, ...	33 8 4	60 0 0	24 0 0	26 to 56
500 Yards, ...				
Manicktullah, ...				
500 Yards, ...	6 10 6	10 11 0	3 12 0	58 to 82
Intermediate, ...				
500 Yards, ...				
From Dum-Dum Bridge to River, ..	4 7 9	6 4 0	3 15 0	84 to 104
500 Yards, ...				
From Dum-Dum Bridge to River, ..				
Average of the East Bank, ..	8 11 9	75 0 0	3 8 0	

No. 405. b.

West Bank.

Rates at which the Ground is let on the Circular Canal Banks.

Situation.	Average.	Maximum.	Minimum.	Lot odd.
From Junction, ...	42 9 7½	55 0 0	30 0 0	1 to 13
Ballecaghatta Bridge, ...				
500 Yards, ...				
Intermediate, ...	32 7 8	60 0 0	15 0 0	15 to 23
500 Yards, ...				
Narculdangah, ...				
500 Yards, ...	27 4 3	60 0 0	7 3 0	25 to 57
500 Yards, ...				
Manicktullah, ...				
500 Yards, ...	8 12 9	15 0 0	6 0 0	59 to 83
Intermediate, ...				
500 Yards, ...				
From Dum-Dum Bridge to River, ..	6 6 11	16 8 0	4 8 0	85 to 105
500 Yards, ...				
From Dum-Dum Bridge to River, ..				
Average of the West Bank, ..	19 15 1	150 0 0	4 8 0	

(No. 406 to No. 410 inclusive, omitted.)

No. 411.

No. 6761.

FROM THE SECRETARY TO THE MILITARY BOARD,

TO CAPTAIN THOMSON,

Superintendent of Canals.

14th April, 1837.

SIR,

I am directed by the Military Board to request, that you will, as soon after the 30th instant as possible, submit a statement exhibiting the gross amount of Toll collected on the Calcutta Canals, since the 1st November last, under your orders, the amount expence of collection and net proceeds of the Toll.

2. You are further requested to specify generally, the nature of the expenditure for collection, showing what portion has been for establishment, and what portion for other charges.

3. The subjoined form, if filled up, will comprise the information now requested.

1836.	Amount of Collection on Canals, exclusive only of Land Rent.			Expence incurred on Collecting Toll, &c.			Net proceeds of Collection.		
November, ...									
December, ...									
1837.									
January, ...									
February, ...									
March, ...									
April, ...									
Total, ...				*					
* Of this amount expended in Establishment, ...									
in Building, ...									
in Contingent Charges, ...									
Total, ...									

4. If in your power, without occasioning delay to furnish this information, the Board would be obliged by your informing them, what portion of the tonnage on which this amount of Toll has been collected, would, under the former system, have been subject to the several Rates then existing.

5. This information would enable them to ascertain, whether a heavier average Rate on burthen has now been levied than was actually the case under the former system, and with this object in view, should you not have sufficient data to give an accurate statement of the above nature, an approximate one would be interesting to the Board.

(Sd.) E. S.

Secretary Military Board.

No. 412.

No. 1.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SECRETARY MILITARY BOARD.

Calcutta: 4th May, 1837.

SIR,

I have the honor to make the following Report on the Canal Tolls, as directed in your Letter No. 6761, of the 14th April, 1837.

2. Accompanying this is a statement (A.) of the gross and net collection of the Tolls during the past six months, with an abstract (B.) detailing the expenditure. No observations on these statements appear necessary. The next return (C.) is a comparison which I have attempted between the former collections and the present. I have with great labor gone over the whole of the abstracts, and some of the details of the returns of the Toll collections for the last 15 years, and, by calculating a system of differences and averages, hoped to arrive at the manner in which the money was collected. A great uniformity existed in the averages of the months and years, but by comparing the daily collections the whole was shown to be artificial, and the uniformity of the collection arranged. I have therefore taken the returns of October last as the most correct, the Toll Darogahs and other establishments being on the alert during that month, in consequence of the enquiries then making into the manner in which they executed their duties.

3. I shall consider Tolly's Nullah and the Ballecaghatta Canal under different heads, as they are very differently circumstanced, and first Tolly's Nullah.

4. The point of most importance in this enquiry is, to ascertain the average burden of Boats navigating Tolly's Nullah. The average, exclusive of Boats under 25 maunds, was, by the former rule of measurement, 375 maunds, the present average is three or four maunds above 300—this gives a proportion between the former mode of measuring and the present, of 13 to 11. There have been about 50,000 Boats measured by the present rule, and these have been compared with 300,000 by the former. I have arrived at the same conclusion by other means unnecessary to detail. On this and similar calculation I have filled up the fourth column of return (C.,) by which it would appear, that the present mode of collecting the Tolls takes from the public (7,083 Rupees,) 5 per cent. more than the former (6,746 Rupees). There has been collected in Tolly's Nullah during the last six months, about 63,750, and judging from the average of former years, 32,000 will be collected during the next six months, making the annual collection 95,750, and deducting 5 per cent. leaves 91,000 Co's. Rupees, or 85,300 Sicca Rupees. The annual average collection in Tolly's Nullah has been 66,500, leaving 19,000 Sicca Rupees unaccounted for. By a comparison of the money collected in October last (or when a new Tussildar was appointed,) with the average collection of previous years, the peculation of the native establishments appears to have been from 15,000 to 18,000 in the year. From other sources of information I believe 20,000 to be nearer the sum. The foregoing comparison is made between the money now collected, and the sum actually raised from the public, but if the former regulation had been strictly enforced, the collection would have been at least 5 per cent. more than the present instead of less.

5. The circumstances and charges affecting the Ballecaghatta Canal are too intricate to detail, I shall therefore confine myself to a few facts. By returns in my office made six years ago, the tonnage of Boats entering the Ballecaghatta Canal greatly (10 per cent.)

exceeded the tonnage entering Tolly's Nullah, yet the Tolls collected in the former^d amounted only to one-fourth of the latter, but the rate in the Canal was only one-half of that in the Nullah. The average collection in the Canal for many years, has been 16,500 Sicca Rupees, yet in May last year the Tolls were farmed at 42,000 Rupees—the farmer held the farm six months, (when there is the least traffic) he paid to Government 21,000, made a profit of 3,500, his expences exceeded 500, and he lost in bad debts nearly 1,000 Rupees, this would show on the old regulation a collection of about 55,000 Sicca Rupees a year; this sum exceeds the half of Tolly's Nullah collection assumed at 85,300, but the excess can easily be accounted for from the nature of the traffic.

6. The boatmen frequenting this Canal, are much more contented with the present rate of Toll than those of Tolly's Nullah are, and strange as it may appear, I am of opinion, that the money paid by a certain number of Boats now (say 10,000) does not exceed what was formerly paid.

7. The gross collection now and formerly, having been shown to be very nearly the same. I have to consider the different parties on whom the Toll now falls, in this respect the difference is very great, that on empty Boats is of most importance and against the Toll, on these the complaints have been loudest. While the owner or manjee of a single Boat had under the former system to pay the full Toll, besides being subject to such extortion as he might be unable to resist, the rich and influential proprietor of a large fleet, required a bill for the Toll to be sent to him which he paid at his own convenience; in proportion to the indulgence shown, he made a present to the Toll Darogah: the consequence of this was, that four-fifths of the Boats have become the property of merchants importing and exporting their own goods, and as each deals only in one article and does not let his Boats out to hire, the Boats always return empty, whether they have imported grain into Calcutta or exported piece goods into the provinces. The crews are paid by the trip on the condition of making a certain number of trips a year. The evil consequences of this are great; twice the necessary number of Boats are required to carry on the traffic of the country, they come in large fleets obstructing the Canals, there is no competition, and consequently no improvement, and they cannot or will not take advantage of facilities held out to them in the navigation. A 1,000 maunds Boat could formerly get through Tolly's Nullah in ten days, they go through regularly now in three days, the difference seven days, at 2 Rupees 7 annas a day: the hire of the Boat is 17 Rupees, or 7 Rupees more than the whole Toll they pay. I have no doubt but that the present plan of collecting the Tolls will have the effect of breaking up this bad system. Traffic usually increases in proportion to the facilities afforded to it, so that no falling off of the Tolls may be anticipated from the Boats passing through loaded both ways.

8. The next difference is on Boats laden with earthenware, bricks, &c., more than three times the Toll is now taken on such Boats, that is, 80 Rupees a year is now taken instead of 25 Rupees, but the Salties and other small Boats engaged in the same traffic pay nothing now, whereas they paid 4,000 Rupees formerly.

9. The Toll formerly paid on Boats entering the mouth of Tolly's Nullah, as far as Kidderpore Bridge, is one-fifth of the present Toll, but the sum shown as collected in October, greatly exceeds the average collection, as 1,000 Rupees is now taken, more than formerly, without any advantage being given for it, which is no doubt a grievance, but I do not see any remedy that would not be more injurious in other respects. Passengers' Boats pay double what they formerly did, nearly, but it is not denied now that half the number of oars were hid, or rather three out of five. The Boats with native families on board have been freed from search, for which indulgence they have, on several occasions, expressed their thanks, and Suwarry Boats have paid their Tolls more readily than any other class of Boats. I should except the Boats having European passengers on board, more particularly if they should happen to be in the Company's service.

10. In carrying into effect the proposition to farm these Tolls, it will only be necessary, to substitute farmers paying a fixed or monthly rent for the present Darogahs. I would retain the controul I now have in preventing evasion of the Toll on one side, or oppression on the other. I was at one time of opinion, that there should be four farmers, as they might be content with less profits than one farmer with four Toll-keepers, but the uncertainty of the collection at each Toll house is great, and in proportion to the risk must be the profit: the amount collected at all the Toll houses together, is much more regular, and if a lease for three years were given the most would be made of the Tolls.

11. The next half year's collection I expect will amount to 35,000 on Tolly's Nullah and 40,000 on the Circular Canal, or a net collection of 1,75,000.

12. I recommended in one of my reports, that the time allowed for Boats to load and unload in Tolly's Nullah be three days instead of seven, I am now of opinion, that the seven days should not be altered, as it has been found a sufficient limitation.

13. Boats hired by the Commissariat Officer pay a Toll according to his measurement, which is one-third greater than mine, this makes my accounts incorrect to a certain extent. I therefore would suggest that I be permitted to order the measurement of the Boats, or which will be the same thing, that the Commissariat Officer makes it part of his agreement with the manjee of a Boat that he pays his own Toll.

I have the honor to be,

Sir,

You most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

No. 412. a.

A.

Statement of the Gross and Net Collection of the Tolls on the Canals, from 1st November 1836 to 30th April 1837, inclusive.

Calcutta : 3rd May, 1837.

Toll Houses.	November 1836.	December 1836.	January 1837.	February 1837.	March 1837.	April 1837.	Total.	REMARKS.
Panspotah, ..	5,421 8 3	5,675 14 0	6,703 14 0	8,307 8 0	6,038 2 0	4,083 5 0	36,230 3 3	During the month of April the wind has been so uncommonly great as to put a stop to a great part of the traffic.
Kidderpore, ..	4,342 4 0	3,798 0 0	3,513 3 0	5,708 13 6	6,115 9 6	3,021 8 0	26,499 6 0	
Dhapa, ..	4,741 11 0	6,024 2 0	7,592 6 0	6,966 2 6	5,657 1 6	3,905 15 6	34,887 6 6	
Chitpore, ..	1,199 12 0	1,592 0 0	1,921 11 0	2,705 11 6	1,188* 2 0	1,283 3 6	9890 8 0	* The Canal was closed for 13 days to allow the Lock-sills to be repaired.
Fisheries and Ferries, ..	0 0 0	36 12 0	7 0 0	108 1 3	38 10 8	73 9 0	264 0 11	
Gross Collection,	15,705 3 3	17,126 12 0	19,738 2 0	23,796 4 9	19,037 9 8	12,367 9 0	1,07,771 8 8	
Monthly expences, ..	403 10 0	379 2 0	436 6 0	394 7 0	324 5 0	393 0 0	2400 14 0	
Net monthly Collection,	15,301 9 3	16,747 10 0	19,301 12 0	23,401 13 9	18,643 4 8	11,974 9 0	1,04,370 10 8	
Expended on Toll Houses and Ghauts, ..	..	..	..	..	..	..	3562 1 9	
Six months' nett Collection,	..	..	..	..	..	..	1,00,808 8 11	

J. THOMSON, Captain.

No. 412. b.

B.

Abstract of the Expenditure.

Months.	Establishment.	Contingent Charges.	Total.		Remarks.
1836. November. . . .	377 0 0	26 10 0	403 10 0		
.. December, ...	377 0 0	2 2 0	379 2 0		
1837. January, ...	393 0 0	43 6 0	436 6 0		
.. February, ...	393 0 0	1 7 0	394 7 0		
.. March, ...	393 0 0	0 0 0	393 0 0		
	2,326 0 0	74 14 0	2,400 14 0	2,400 14 0	
Building Toll Houses, Ghauts, &c.					
Pauspotah, ...			541 15 1	2,946 14 6	
Kidderpore, ...			1,549 8 2		
Dhapa, ...			1,243 11 3		
Chitpore, ...			434 12 9	615 3 3	
				Store, materials, cash.	
Value of two Tents, . . .	275 3 2				
Deduct two old Toll Houses sold. }	64 0 0		211 3 2		
			6,382 0 5		
			5,962 15 9		
				5,962 15 9	
N. B.—A further sum of about 50 Rupees will be expended in painting no- tices on boards, and erecting them at the Toll Houses and Ferry Ghauts, and to meet which the Tents may be sold for 100 Rupees			419 0 8		Value put on old mate- rials receiv- ed from the Dredging Boat, that have been used up.

J. THOMSON, *Captain.*

No. 412. c.

C.

Analysis of the Tolls collected in Tolly's Nullah during the month of October, 1836.

1. No. of Boats Passing and Re- passing through Tolley's Nullah.	2. Measured Burden by former Re- gulation. Maunds.	3. Toll taken in Sicca Rupees.	4. Toll that would have been tak- en by the pre- sent Regula- tion in Sa. Rs.	REMARKS.
1157	492,909	4,949 12 6	3,190 0 0	{ Loaded Boats that entered the Nullah at both ends, or having entered empty come out loaded; these latter would be entered twice, but I have made no allowance for that.
1195	4,10,886	1,027 5 6	3,260 0 0	
.. ..	1400	3 8 0	11 0 0	{ Empty Boats.
62 .. ..	.. ..	24 3 9	115 0 0	{ Boats laden with Bricks and Earthenware, &c.
602 .. ..	.. ..	317 0 0	507 0 0	{ Boats that entered as far as Kidderpore Bridge only.
1322 .. ..	.. ..	243 10 0	0 0 0	{ Boats with passengers.
.. ..	.. ..	181 6 0	0 0 0	{ Salties and other small Boats.
.. ..	.. ..	.. ..	.. ..	{ Ditto from Kawrapookrya Khal.
.. ..	.. ..	6,746 13 9	7,083 0 0	{ Or Company's Rupees 7,555-3-2.

J. THOMSON, *Captain.*

No. 413.

No. 62

To CAPTAIN JOHN THOMSON,

Superintendent of Canals.

5th May, 1837.

SIR,

I am directed by the Military Board to request you will, if in your power, furnish as soon as possible, a statement exhibiting the number and tonnage of Boats that have passed into the Circular Canal and Tolley's Nullah since the fiscal duties of those Canals have been committed to your control, showing also the description of goods with which they were loaded, and with reference to the altered system of Toll and mode of measurement for Tonnage, exhibiting as nearly as possible, what would have been the amount collected since 1st November last, had the old rate continued in force.

The Board think it probable, that you may not be able to complete a perfect statement of this character, but they request you will furnish it as fully as the Register you have kept and Records of your Office permit.

I have, &c.,

F. SANDERS,

Secretary Military Board.

excix

No. 414.

No. 3.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta: 6th May, 1837.

SIR,

With reference to the returns of Boats required by you, in your letter No. 62, of the 5th instant, I have the honor to state, that I have made no enquiry respecting the lading of any of the Boats that have entered the Canals within the last six months. I have given strict orders to the Toll Daroghas not to enquire into or interfere in any manner with the lading of the Boats, as this enquiry could not be made without keeping up the system of searching the Boats, with the natural consequence of plunder and oppression.

The number of Boats that entered Tolly's Nullah were 20,030, average burden of each 305 maunds, and the number that entered the Balliaghatta and Circular Canals, 29,720, average burden of each 150 maunds.

I have the honor to be,

Sir,

Your most obedient Servant,

J. THOMSON, *Captain,*

Superintendent of Canals.

(No. 415 and No. 416 omitted.)

No. 417.

TO THE RIGHT HONORABLE

GEORGE, LORD AUCKLAND, G.C.B.,

Governor of Bengal.

Revenue Department.

MY LORD,

We have the honor to acknowledge the receipt of Secretary Mr. Mangles' letter,

The Board submit a report on the general results of the system of Canal management, established by Regulation dated 1st November, 1836.

No. 464, of the 11th ultimo, and in conformity to the instructions therein conveyed, beg to submit a report on the general results of the system of Canal management, established by your Lordship in the Regulation bearing date 1st November, 1836.

2. We forward herewith copy of a letter No. 1, of the 4th instant, from Captain John Thomson, Superintendent of Canals, together with its enclosures, and on the facts stated and deductions drawn from them by that Officer, beg to offer the following observations.

3. Captain Thomson states, that the present mode of measurement compared with that formerly used, gives the present burthen of Boats as 303 or 304 to 375, being a reduction of nearly 20 per cent. on the former rate.

4. Captain Thomson also states, that the average rate of Toll on Tolly's Nullah under the old Regulation would, if strictly enforced, have realized about 5 per cent. more than the present rate, but through the venality of the collectors the full rate was not exacted, and about 5 per cent. less than at present was actually levied from the public.

5. The period of one month before the introduction of the present system which has furnished data for the above statement is too short to admit of our regarding the comparative amount of the present and former rates of Toll, deducted by Captain Thomson, as a very close approximation to the truth.

6. The actual financial results on the Eastern Canal or Tolly's Nullah show, that under the operation of the new system the sum of Rupees 62,729 : 9 : 3 has been collected on this line, and judging from the comparative extent of traffic of the other six months of the year, a collection of Rupees 32,000 more is anticipated, this will exhibit a net collection of 90,000 Rupees, the average of former years having been about 70,000 Rupees.

7. On the Balliaghatta and Circular line of Canals the results of the collection have been still more satisfactory. The total amount collected during the past six months has been Rupees 44,777 : 14 : 6, and the anticipated collection for the ensuing six months is 40,000 Rupees, the average collection on this Canal has hitherto been 17,600 Rupees annually, so that on this line the amount carried to the Government account would seem to have been nearly quintripled.

8. On the whole, the net Toll already realized during a period of six months on both lines of Canal considerably exceeds the average amount formerly collected during the whole year.

9. Captain Thomson Reports, that the Toll presses more heavily than it formerly did on the undermentioned classes of persons frequenting the Canals.

1st. On Boats conveying Passengers.

2nd. On Boats laden with Bricks, Straw, &c.

3rd. On Empty Boats entering Tolly's Nullah only as far as Kidderpore Bridge. And it entirely relieves from Toll—

1st. All Boats under 25 maunds burthen, which formerly paid about 400 Rupees annually, and which now pass free.

2nd. The Boats frequenting the Kamapokarya Khal or Creek, which falls into Tolly's Nullah, and which formerly paid from 8 to 10,000 Sicca Rupees per annum, and which now pass free.

10. We beg to remark with reference to the pressure of the Toll on Boats conveying passengers, that it is also stated by Captain Thomson that a great portion of the Toll was formerly evaded by this class of Boats by concealing their oars, and that the exemption from search, accorded by the new Regulation, is more highly appreciated by this particular class than by any other.

11. We have already in our Letters Nos. 5411, 5412, and 5414, of the 3rd February last, so fully expressed our sentiments on the subject of making exemption of Tollage for Boats making use of but small portions of the Canal, that we need not recur to the subject of the pressure of the Toll now felt on goods entering the Tolly's Nullah from the Hooghly River, and proceeding as far only as the Kidderpore Bridge, we will merely repeat that whatever alterations or modifications may be made with the view of meeting this evil it will serve only to render the present system complicated, and perhaps to shift the position of the point of grievance.

12. The general result of the system may, we think, be pronounced exceedingly favorable. We have stated that the collections during the past six months exceed the average collection of a long series of years, and that the total annual collection promises to double that of any former year.

13. If this increase were attributable solely to a heavier demand being exacted from the public it would be no subject for congratulation. But from the report of the Superintendent there appears every reason to believe, that such is not the case, and it is a strong fact, that, although the Toll on the Balliaghatta Canal was formerly but half that on Tolly's Nullah,

and that the Tolls on both lines are now equalized, by far the greatest comparative increase in the amount of Toll collected has taken place in the former line of Canal, and this increase to an extent that no possible difference in the supposed amount of rate paid could account for.

14. If it be admitted that the direct collection now made for the benefit of Government does not exceed the amount formerly levied, and a great portion of which was misapplied, the direct gain to the public from the change of system, in the mode of collecting the Toll, cannot possibly be doubted, since unauthorized exaction for an indirect purpose must be raised by oppressive measures, and fall most heavily on the poor and unprotected class.

15. It appears also that greater facilities are enjoyed by the trader, in passing his Boats through the Canal under the present than under the former system, this may be easily understood from the number of Toll houses being diminished, from empty Boats being no longer allowed to remain for indefinite periods in the Canal to the obstructions of free navigation, from the removal of the Toll house at the junction of the Circular with the Balliaghatta Canal, thereby throwing that line open to the Boats that formerly blocked up the head of the latter or Entally Canal, and from the detention caused for the purpose of ascertaining by search the nature of goods embarked, being now removed.

16. In submitting this Report to Government, we are not prepared to advocate any immediate change in the established rate, or mode of collection of Toll on these Canals, still less to advise any partial or local exemptions. Calculating on the augmented revenue derived from these Canals, we have submitted to Government several propositions tending to improve their navigation, and afford increased facility to the traffic and Boats frequenting them, and if all these projects are sanctioned by Government, a considerable portion of the Revenue drawn from the Canals will be returned to the Toll payers in the only legitimate mode in which we think this end can be accomplished.

We have, &c.,

(Signed) D. McLEOD, Colonel, Chief Engineer.

„ D. McFARLAN, Chief Magistrate, Member Military Board.

MILITARY BOARD OFFICE : „ A. IRVINE, Major, Member Military Board.

16th May, 1837. „ T. M. TAYLOR, Major, Member Military Board.

No. 418.

No. 744.

To THE MILITARY BOARD.

Miscellaneous Revenue.

GENTLEMEN,

I am directed by the Right Honorable the Governor of Bengal to acknowledge the receipt of your Letter, dated the 16th instant, in reply to His Lordship's requisition of the 11th ultimo, for a Report of the results, financial and general, of the new system of Canal management, and to communicate as follows in answer.

2. His Lordship considers your Report to be very satisfactory,—the more so, because it seems clear that the increase in the nett income derived from the Canals is attributable rather to improvement in the system of management, ensuring greater honesty on the part of the collecting officers, than to any enhancement of the Toll, for this result Captain Thomson is entitled to much credit, and as it is desirable to place his appointment on such a footing as to obviate any desire for an early change, and thus to retain the benefit of his

local experience, the Governor is now pleased to accede to the recommendation conveyed by your letter of the 31st of March last, and to grant to Captain Thomson a temporary addition to his salary from the 1st of April, of Rs. 150 per mensem, as long as the collection of the Tolls is entrusted to him.

3. His Lordship thinks it desirable that matters should remain for the present, at least, upon the existing footing. The increased produce of the Toll will cover the expenses attendant upon the operations for the improvement of the several lines of navigation, and for the convenience of the traffic frequenting them, which have been already sanctioned, or which may hereafter appear expedient. At the end of the year you are requested to report whether any reductions in the rate of Toll are required, and whether they can be effected without sacrifice of the principle of non-discrimination, which appears to be productive of a great preponderance of good. But as far as the information at present before His Lordship enables him to judge, he is inclined to think, that the true interests of the public will be better consulted by the prosecution of the improvements above alluded to, than by a reduction of the Toll.

I have the honor to be,

Gentlemen,

Your most obedient Servant,

FORT WILLIAM :
The 30th May, 1837.

ROSS. D. MANGLES,
Secretary to the Government of Bengal

No. 418 $\frac{1}{4}$.

No. 134.

FROM COLONEL R. TICKELL, C. B.,
Superintending Engineer, Lower Provinces.

TO CAPTAIN E. SANDERS,
Secretary Military Board.

Canals.

SIR,

Barrackpore : 5th May, 1837.

With reference to your letters Nos. 3340 and 6500, of the 25th October and 28th March last, and to my Reply No. 4066, of the 3rd ultimo, I have now the honor to forward a section of the Gobra Khal, and a Plan and section of the Dam which Captain J. Thomson proposes to construct, as also a sketch including the Khal and the Balygunge and Bhowanypore Canals, accompanied by a copy of that Officer's Report, No. 146, dated the 12th ultimo, on the advantages or otherwise that may be anticipated from the execution of this work.

2nd. Enclosed is also a revised Estimate No. 11, of the probable expence of damming up the Gobra Khal, amounting to Company's Rupees 6,496 : 12 : 9.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, *Colonel,*
Superintending Engineer, Lower Provinces.

No. 418 $\frac{1}{2}$.

No. 146.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals.

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 12th April, 1837.

I have the honor to forward the Plans and section of the Gobra Khal and adjoining Canals, called for in your Letter No. 2403, of the 28th October 1836, and have to report, that the object proposed to be attained by damming up the Gobra Khal is to force the water for the supply of the Northern portion of the Gobra Khal and the Jheel with which it is connected, through the two Canals (the Bhowanypore and Baleygunge), as the quantity of water now ebbing and flowing through the Gobra Khal is thirty times more than that which passes through both Canals; the quantity of water to scour out the Canals is ample, and the success of the measure is as certain as such kind of projects are capable of. One cause of failure may be, that the whole of the water will take its course by the Baleygunge Canal and not improve the Bhowanypore Canal, as the outfall by the former Canal is much nearer than by the latter Canal. It is further necessary for me to observe, that it would be expedient to undertake this work only in case it is intended to re-excavate the

An Estimate for this will be forwarded. Chaltabarya Canal, and to execute all other works necessary to keep up the navigation of the Sunderbund Canals.

2nd. If the damming of the Gobra Khal is authorized, the work would be commenced in November 1838, and as the Chaltabarya Canal could not from want of workmen be dug out before the next season, 1839-40, at a probable cost of 15,000 Rupees, the expediency of keeping up this navigation cannot be confidently determined on until the latest period, say, May 1838, but this would be too late to take into consideration the estimates of the proposed works. I would therefore suggest that the estimates for the repairs be now forwarded for the consideration of Government, subject to the condition that they are only to be carried into effect if the Sunderbund Canals are to be kept up. It is highly desirable that the question of whether the Sunderbund Canals are to be kept up or not were settled. For this purpose I shall be happy to collect any information bearing on this point which you may suggest.

I have, &c.,

(Signed) J. THOMSON, Captain,
Superintendent of Canals.

(True Copy.) R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 418 $\frac{3}{4}$.

SIR,

16th June, 1837.

I am directed by the Military Board to acknowledge the receipt of your Letter, No. 134, of the 5th ultimo, giving cover to an estimate from Captain Thomson, exhibiting the probable expence that would be incurred in carrying into execution his proposition for Damming up the Gobra Khaul.

2. Captain Thomson, in his Letter No. 146, of the 12th April last, to your address, seems to consider the future maintenance of the Soondurbun Canals as a doubtful point. The

Board are not aware of the grounds on which such a supposition, as the possibility of their abandonment could have been founded. They attach great importance to the preservation of this line of navigation in as efficient a state as possible, and are disposed to recommend any measures which may come before them, calculated on clear and well considered grounds to improve these Canals.

3. The project for Damming up the Gobra Khaul, does not appear to the Board to have received that full and attentive consideration from the Superintendent which the importance of the undertaking demands. And the position of the proposed Dam, whether on the North or South side of the Canal is not distinctly stated. The Board gather from Captain Thomson's report, that he doubts whether the attempt at Damming up the Khaul would be successful, and should it succeed he is still uncertain of the direction in which the waters of the Jheel, from which the Gobra Khaul takes its rise, would pass through the Canal.

4. It occurs to the Board, that this latter point might have been ascertained beyond a doubt by a careful registry of the Tide levels in the Bailey Gunge and Bhowaneepore Canals.

5. Until therefore the Superintendent can more distinctly state his confidence of a successful result to the undertaking, and give a more decided opinion as to the degree of advantage to be derived from this heavy outlay, the Board are compelled to withhold their recommendation to the execution of the work.

6. I am further directed to observe, that the details of Captain Thomson's scheme are too imperfectly developed to enable the Board to come to any conclusion, as to its merits or probabilities of success, nor is the proposition accompanied by any remarks or opinion from yourself, either favorable or unfavorable as to the practicability or advantage of the undertaking.

I have, &c.,

E. SANDERS,

Secretary Military Board.

(No. 419 to No. 421 inclusive, omitted.)

No. 422.

No. 445.

FROM COLONEL R. TICKELL, C. B.,

Superintending Engineer, Lower Provinces,

TO CAPTAIN E. SANDERS,

Secretary Military Board.

Canals.

SIR,

Barrackpore: 29th May, 1837.

I have the honor to submit for the consideration of the Military Board, copy of Captain Thomson's annual Report, No. 7, dated the 16th instant, on the Canals under his charge for the present season.

2nd. No arrangements, it appears, have yet been brought forward in regard to the Town Drains, but this can only be effectually done in conjunction with the Conservancy Department and Fever Hospital Committee, who I understand have already directed their attention to this important subject, on which it would be useless to speculate until the result of their labours is known, and some definite plan prepared for the Drainage of the Town that shall not interfere, as it has hitherto done, with the navigation of the Circular Canal.

3rd. With reference to the 2nd paragraph of the accompanying Report, Captain Thomson informs me, that the remaining two-thirds of the pukka Road and Drainage of the North side of the Entallee Canal, and about one-fourth of the Banks and Drains of the Balliaghatta Canal, North side, will be finished, the first by the beginning of October, and the second about the middle of June.

4th. Adverting to my Letter No. 180, of the 9th instant, reporting that Captain Thomson had expended the whole of the 3,000 Rupees advanced to him on account of the latter work, and that little more than two-thirds of it had then been completed, that Officer states, that about 1,000 Rupees more are required, but that he has a Balance in hand more than sufficient to meet this contingency, arising from digging out the Entallee Canal and other works executed below the cost at which they were estimated.

5th. In regard to Captain Thomson's proposition for clearing out the sand and mud deposited in Tolly's Nulla by the Kowarah Pookarya Khal, I am informed by that officer, that, supposing the shallowest part to extend 1000 yards at the utmost, 300 being dry at low water, and the Nulla excavated to that extent by hand in April, May and June, 1838, two more seasons, 1839 and 1840, would be sufficient for completing the five miles, which require to be cleared out by the Dredger. The mouth of the Khal above-mentioned being of course permanently closed by a pukka Bund across it, with a Lock and set of Gates, 5 or 6 feet wide. Detailed Plans and Estimates for which, Captain Thomson will submit in the course of two or three months, by which time he will have obtained further and more accurate information on the subject.

6th. I have nothing to add at present on the subject of the expenditure proposed for the ensuing year, as shown in the abstract, which appears moderate, and, after reducing the 2nd item for the excavation of the intended Docks in the Salt Water Lake to 10,000 Rupees, amounts to Company's Rupees 23,700.

I have the honor to be,

Sir,

Your obedient Servant,

R. TICKELL, *Colonel.*

Superintending Engineer, Lower Provinces.

No. 422. a.

No. 7.

FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

Lower Provinces.

SIR,

Calcutta: 16th May, 1837.

I have had the honor to report so frequently during the past season on the Canals, that an annual report may be considered almost superfluous; but there are some things relating to them that cannot be too often brought forward, and one of these is, the Town Drains, which run into the Circular Canal. The Government have, with liberal consideration, removed all the numerous impediments to improvement under which this line of navigation suffered, excepting this one, of the Drains. All my endeavours to get any improvement made in the Town Drains sanctioned, have been unavailing, and there is no other resource left to me but to recommend that the mouths of all the Drains, leading into the Canal, be

built up, leaving the Board of Conservancy to make such arrangements for the Drainage of the Town as they consider most proper. The benefit that these Canals would derive by

(a) The estimated cost of re- closing the Drains would exceed 3,000 Rupees^(a) a year, which
moving the mud by Dredging. at 15 years' purchase will be 45,000 Rupees; this sum might
—R. T. therefore fairly be debited to the Canal account, and paid over to

the Conservancy Department for the benefit received. Since the year 1832, when Colonel Wood's Committee recommended the closing up of these Drains to the present time, a variety of expedients have been proposed to meet the objections which it is supposed must exist to any improvement in this particular case: I am therefore reduced to the necessity of recurring to the only effectual remedy of the evil, and recommending the closing up of these Drains.

2nd. All the repairs recommended by me two years ago, as required by these Canals, have been now completed, with the exception of about two-thirds of the pukka Road and Drainage of the Entally Canal, North side, and about one-fourth of the Banks and Drains of the Balliaghatta Canal, North side. The efficiency of the Drainage will have to be tested by the rains of one season, and any defects which may appear, remedied before they can be said to have been satisfactorily completed; yet, as far as the effects of these repairs (including those in the Lake) have appeared, they have fully answered my expectations, the Canals having become deeper instead of shallower during the last year. This favourable state of the navigation must be partly attributed to the little rain that fell during the past season.

3rd. The expenditure during the ensuing season on the Circular and Balliaghatta line of Canals will be, (in addition to the usual current repairs to Roads) an extra establishment of five Coolies to remove obstructions from the Drains, of which there are about 13 miles, and to attend to about 700 trees.

4th. The Docks for Boats, proposed to be dug at Chingreeghatta, will occupy the whole of my attention for the season in that direction.

5th. Within the last four or five years little change has occurred in Tolly's Nullah.

Tolly's Nullah. The greatest evil attending this line of navigation is the sand brought into it by the Kawarah-pookrya Khaul. For a long time 600 Rupees a year used to be expended in removing the sand Bank at the mouth of this Nullah. I removed it in the month of December 1835, and last December it had not materially increased, as there had

	Depth.	
High water.		
Springs,	5 feet,	8 inches.
Ditto.		
Neaps,	2 "	0 "
Low-water.		Above
Spring,	} 1 foot,	water.
and		
Neap.		4 inches,
about 300 yards in length: dry		
at low-water.		

been no heavy rain during the preceding year. Although the worst part of the Bank above low-water mark, formed of the coarsest sand, was thus annually dug out, yet for three miles on the East side and two miles on the West side of the Khaul, the Nullah has been getting shallower every year, and now about five miles of it is not more than a few inches deep at low-water. The least depth of water is stated in the margin.

6th. No permanent improvement of the depth of this Nullah can be made until the mouth of the Khaul is closed up. The cheapest manner of deepening the Nullah will be to Dam out the water, and excavate the mud. If the loss of Tolls are taken into consideration, Dredging would be cheapest: either plan will be a very difficult operation. As it may be more than two years before the Dredging Boat is ready, I will state what I consider the best plan of excavating the Nullah. The months most favourable for undertaking the work, all things considered, are April, May, and part of June; with the usual number of workmen I can command, I could in that time excavate in that sandy soil, which dries quickly, about 1,000 yards in length. The work would cost about 4,000 Rupees (there will be about 1,000 Chowkabs), but the loss of Tolls may amount to 6,000 Rupees. The shallowest part of the Nullah would be first excavated, and until that is done, I need not speculate on the cost of the rest of the work.

7th. A considerable *traffic* is carried on by the Kawarah-pookrya Khaul,^(b) in Damming it up therefore, a Lock about five feet wide for the passing of the small Boats that frequent the Nullah, would have to be constructed. The Drainage of the country would also have to be provided for, and although I have given the subject much consideration during the past six months, yet I have not been able to draw up a satisfactory plan of proceeding, and yet am loath to lose another year—estimates for these repairs in Tolly's Nullah will be framed by me in two or three months, or as soon as I have procured sufficient information.

8th. The success which attended the Dredging in the Ballecughatta Canal, leads me to hope that, if the Kawarah-pookrya Khaul were closed, and the worst part of Tolly's Nullah excavated by hand, that two seasons' Dredging, at an expence of about 8,000 Rupees, would complete the work, and this arrangement would be most suitable for the carrying on of the other works on the Eastern Canals generally.

9th. The declaration of the Right Honorable the Governor of Bengal, that the Tolls derived from the Canals should be devoted to the improvement of the water communications with the Eastward, has settled in my mind (what I before considered doubtful) the expediency of keeping up the Sunderbund line of navigation; but as there will be as much work as I can attend to, next season near Calcutta, I do not recommend for the present season any work in the Sunderbunds, except cutting jungle and repairing and improving the Tow-paths: for this purpose I have agreed with a gang of *dangur* coolies, and the expences will be as usual, about 900 Rupees.

10th. The following is an abstract of the work to be done during the ensuing season, in addition to the ordinary current expences of establishments and repairs.

Abstract.

No. 1.—Digging out the Dhurmtullah Cess-pool, according to the details of last year's estimate, ...	800
(c) Expence has subsequently been limited to 10,000 Rs.—R. T.	
No. 2.—Excavating Docks in Salt Water Lake, Estimate No. 6, dated 6th March, 1837, ..	21,515 ^(c)
No. 3.—Damming up the Kawarah-pookrya Khaul, the Estimates for this work will be submitted hereafter, ...	8,000
Excavating 1000 yards in length of Tolly's Nullah, the Estimates for this work will be submitted hereafter, ...	4,000
No. 4.—Sunderbund Tow-path, repairs of, according to last year's Estimate, ..	900
	35,215

11th. If the plan of proceeding proposed in this report should meet with your approbation, I shall have the honor of proposing to make the Dam on the Gobra Khaul during the season 1838-39, and to re-excavate the Chaltabarya Canal in 1839-40, this last work could not be deferred another year without causing a great proportional increase of cost, besides the entire stoppage of the navigation. With this prospect of work before me, besides what may arise in the course of the next three years, I am of opinion, that none of those works can be deferred a single year, without materially injuring the navigation.

I have, &c.,

(Signed) J. THOMSON, *Captain,*
Superintendent of Canals.

(True Copy.) R. TICKELL,
Superintending Engineer, Lower Provinces.

No. 423.

No. 1057.

FROM THE SECRETARY MILITARY BOARD,

TO THE SUPERINTENDING ENGINEER, LOWER PROVINCES.

SIR,

23rd June, 1837.

I am directed by the Military Board, to acknowledge the receipt of your Letter No. 445, of the 29th ultimo, enclosing a copy of Captain John Thomson's annual report on the Canals, No. 7, of the 16th idem, to your address.

2nd. The Board remark, that they certainly have had before them, complaints from the present Superintendent of Canals, regarding the Town Drains, and they have expressed themselves desirous of adopting measures for removing, as far as possible, the inconvenience complained of, provided any distinct, specific and feasible remedy can be suggested by the Superintendent.

3rd. I am desired on the present occasion to repeat this expression of their sentiments, and to observe, that they cannot possibly act on general representations of difficulty and inconvenience.

4th. The Board can hardly believe Captain Thomson has seriously contemplated the effects of his proposition for blocking up the mouths of the Calcutta Drains, without any other mode of carrying off the Drainage of the Town being devised. They will not therefore further notice it, than by expressing their opinion, that if the current admitted through the Lock-Gates is insufficient wholly to clear away the deposit of silt brought in by the Town Drains, this deposit should be dredged out at the first opportunity, unless the Superintendent can propose some less objectionable scheme for obviating the evil or a more efficient and economical mode of effecting the object.

5th. For this and other purposes, the Board are extremely desirous of seeing the Superintendent of Canals in possession of a Dredging Vessel, which may place the means of effecting improvements and removing impediments of this nature in his hands. Captain Johnston has again been addressed with a request, that he will expedite the dispatch of his estimate for the iron Boat required for the Steam Dredging Machinery, and your attention is requested to my Letter No. 694, of the 2nd instant, calling on Captain Thomson for an estimate for a Vessel to contain the Hand-dredging apparatus, which it is stated has been recently improved and rendered more efficient by the Superintendent at a considerable outlay.

6th The consideration of Captain Thomson's proposition for Damming up the mouth of the Kawrapokarya Khaul, must be deferred until that Officer shall have procured the information alluded to in the 7th para. of his report, to enable him to bring forward some plan for Draining the country, which would otherwise be laid under water during the rainy season from closing the Khaul. This project appears to the Board to be submitted on uncertain grounds, as well as in a vague and unsatisfactory manner, and from the little information Captain Thomson has yet given on the subject, it seems to the Board a measure of very doubtful expediency.

I have, &c.,

E. SANDERS,

Secretary Military Board.

(No. 424 to No. 442 inclusive, omitted.)

No. 443.

No. 1300.

Extract of a Letter from COLONEL R. TICKELL, C. B., Superintending Engineer, Lower Provinces, to CAPTAIN E. SANDERS, Secretary Military Board, Barrackpore: 29th July, 1837, in reply to his Letter No. 1057, of the 23rd ultimo, relative to CAPTAIN THOMSON'S last Annual Report on the Canals, No. 7, of the 16th of May.

"Adverting to the 2nd paragraph of Captain Thomson's Letter, there can be no doubt, I imagine, but that the Town Drains should not be allowed to empty themselves into the Canal and impede the navigation, as they have hitherto done every year, owing to the great quantity of silt and gravel which they bring down and deposit in it; but this serious inconvenience can only be obviated by the Superintendent of Canals, in conjunction with the Conservancy Department, with whom measures might be suggested and arranged for the construction of a Main Drain or Sewer parallel to the Circular Road, or any other plan that might appear most advisable; but until this is done, the Circular Canal will never be free from those frequent interruptions in its navigation, which have hitherto proved so detrimental to its interests, and inconvenient to the public."

No. 443. a.

No. 32.

EXTRACT OF A LETTER FROM CAPTAIN JOHN THOMSON,

Superintendent of Canals,

TO THE SUPERINTENDING ENGINEER,

*Lower Provinces.**Calcutta: 17th July, 1837.*

"SIR,

I have the honor to acknowledge the receipt of your Letter No. 1011,^(a) on the subject of my Annual Report on the Canals, with a copy of the
 (a) Of the 8th July. Military Board's Letter, No. 1057.

"2nd. The first subject to which my attention is called, is that of the Town Drains; the various projects for remedying the mischievous effects of which I have from time to time brought forward, have not been considered by the Military Board specific and feasible; the remedies proposed appeared to me clear and practicable, as far as regards the Canal, and I have not been permitted an opportunity of bringing before you the effect these changes would have had on the interests of the Town of Calcutta: but I have on several occasions been called on to state my opinions on the combined interest of the Town and the Canal, and in this light I do not hesitate to state, and am supported in opinion by Captain Forbes, and the majority of those who have given their attention to the subject, that the Drains running into the Canals should be closed, and the Drainage of the Town provided for by independent Drains.

" 8th. I was led into the expence of planting the trees on the Banks of the Circular Canal, without previous sanction by Ashootus Day and other natives offering to pay the expence; but after a year's delay I could get nothing but the prime cost of the trees which I had planted—not wishing to lose another season and the favorable opportunity of the Banks undergoing repair. The trees, 750 in number, are fruit trees, and in four years may be expected to give a return of 500 Rupees a year, or pay for the expence of keeping clean and in good order the Banks of the Canal after paying all the expences; this, although a desirable improvement, was not a necessary expence: on this account, I did not propose that the work should be paid by Government; after the trees planted, there was an expenditure of 160 Rupees for trees which had died, and for bamboos, &c., to protect them: this sum was charged in my bill for repairing the Banks of the Canal (marked Bill No. 585, Book H. of 1836-37, Military Board Office, vide Superintending Engineer's Letter No. 3495, dated 3rd February 1837)."

(No. 444 to No. 446 inclusive, omitted.)

No. 447.

No. 636.

TO THE MILITARY BOARD.

GENTLEMEN,

I am directed by the Right Honorable the Government of Bengal, to forward to you the accompanying Copy of a Dispatch from the Honorable the Court of Directors, to the address of the Government of India, under date the 18th of January last, and to request that you will favor His Lordship with a report upon the present condition of the Eastern and Circular Canals, with special reference to the points adverted to by the Honorable Court, viz.

The fitness of the Lock at Chitpore for the object of its construction.

The means employed to remove the silt deposited in the Canal by the Calcutta Drains and the expence incurred on that account during the last three years.

The average number of Boats which pass through daily, and the number which can pass in a day.

Whether the consequence apprehended by Colonel Galloway from the mingling of the waters of the Lake and the River have been felt, and if so, in what degree and with what effect.

The information called for in paras. 27 and 28, of the Honorable Court's present dispatch, relates to the Draining of the Salt Water Lake, adverted to in your Board's Letter, No. 4614, dated the 7th of February 1834. That communication with the

See Mis. Rev. Con. of the Government of India, 5th March 1838, Nos. 8 to 11.

measures proposed by the Committee appointed to report on the subject, was brought to the notice of the Honorable Court in a dispatch of the Council of India, dated the 23rd December 1835, but as no reply has yet been received to that dispatch, His Lordship deems it unnecessary to revive the subject at present.

Paras. 67 to 82 of No. 10 of 1835.

I have, &c.,

FORT WILLIAM:
The 9th May, 1837.

(Signed) R. D. MANGLES,
Secretary to the Government of Bengal.

No. 447. *a.**Revenue Department.*

No. 2 of 1837.

OUR GOVERNOR GENERAL OF INDIA IN COUNCIL.

Para. 1. We informed you under date the 18th January 1837, that paragraphs 2 to 21 of your Letter, under date the 17th February (No. 2,) 1834, respecting the operations on the Eastern and Circular Canals would form the subject of a separate dispatch.

2. Of the 3,50,000 Rupees authorized for the operations on the Circular Canal, we observe by the proceedings referred to in the paras. above noticed, 2,02,155 Rupees have been expended, and there appears to have been proper attention paid to economy and usefulness in the general outlay, the actual cost of the works not exceeding the estimates in the aggregate.

3. The only subject on which we see any occasion to remark, is the modification which you authorized in the plan originally sanctioned for the construction of the Locks at Chitpore, the point at which it was determined to connect the Circular Canal with the Hooghly.

4. Great inconvenience appears to have resulted from the accumulation of silt deposited in the Canal by the Calcutta Drains, an undeniable evil, which it was expected would be removed by introducing a stronger current of water from the Hooghly into the Canal, than would be admitted by the Locks as originally sanctioned.

5. It is reported that the heavy rains in August 1832, did considerable damage to the operations, and to this circumstance is attributed the necessity for the alteration in the original design for the Lock at Chitpore, as appears fully and satisfactorily explained by Mr. James Prinsep.

6. It appears that the conduits which discharge the Drainage of the City into the Canal, and which had been but recently completed at a cost of 12,400 Rupees, were found to "afford too easy a vent for the Drain water, which carries a large quantity of suspended matter into the Circular Canal."

7. This was causing considerable injury to the Canal, and required the application of an immediate remedy, for although the Dredgers were kept constantly at work, they could not, it appears, keep pace with the deposit.

8. The subject was an important one, and induced you to procure the best information, and with that view you appointed a Committee of Engineer Officers to survey the works, the Military Board being directed specially to report thereon.

9. It was necessary it appears, in order to maintain the original plan of all the works, to keep the Canal at a height not exceeding nine feet above zero; as should the height be raised more than ten feet above the zero of levels, it would be even with the Road, and according to Mr. Prinsep, "entirely prevent the Drainage of a considerable portion of the Town whilst it continues at that elevation." It was necessary too, to preserve the level of the Canal, in order to admit of Boats passing under the Bridges; Colonel Tickell therefore agreed in opinion with Mr. Prinsep, that one large Lock of from 30 to 32 feet in breadth, instead of two Locks of 24 feet, would be preferable on the ground of expence of general utility, and the ready means it would afford of throwing open communication with the Sunderbuns.

10. The Military Board considered the accumulation of mud and filth in the Canal over-rated by the Committee, who estimated that during one rainy season 883,000 cubic feet

had collected, and the Board were further of opinion, that the Committee had under-rated the counteraction of the Salt Water Lake in scouring the Canal. The Board gave their reasons for questioning the accuracy of this statement, but the Committee appear, by taking soundings and adopting other modes of procuring evidence during their survey of the Canal, to have obtained sufficient data whereon to found correct conclusions.

11. Colonel Galloway appears to have questioned the expediency, and even the possibility of permanently maintaining the navigation of this Canal, from the shoals arising at the mouth of the Drains. He observes—"No doubt a Lock passage firmly founded and substantially built, with the Banks of the Canal raised sufficiently as Mr. Prinsep suggests, would protect the Town from danger and from inundation, *except by the Drains*, and no doubt also a passage might be formed on a scale small and sinuous enough to be safely opened into the River without any Lock, as the Mahratta Ditch at Chitpore demonstrates. But before we can argue that because such an opening as that of the Mahratta Ditch at Chitpore exists with safety, contracted throughout and winding by a lengthened devious course, that so also the straight and wide Circular Canal, leading from the River by an easy and short line into the expanded basin of the Salt Lake, 12 feet lower than that River also safely exist, we must be prepared to maintain, that all forces are equal, all quantities equivalent, and that extent of cause produces no magnitude of effect."

"The flimsy nature of the Lock passage, proposed by the late Captain Prinsep, submitted as that which had originally obtained the sanction of Government, weighed much with me. By the plan now submitted that has been greatly reinforced and strengthened. The central Pier which was only 8 feet thick is now 26, and the foundations are carried down 10 feet instead of 2, the whole of the work being also piled in front and in rear. If the Canal is to be opened, no expence, no pains ought to be spared to fortify the works of the Lock."

12. There can be little doubt that after the communication with the Hooghly has been effected, the alternate flow of water between that River and the Salt Water Lake, will have some effect in clearing the accumulation at the mouths of the Drains. We are not however, without our apprehensions that this is an evil, which will not be remedied at so easy a cost as you anticipate. The plan of throwing a Bund across the Canal, and removing the deposit by means of hand labour, the most economical mode suggested as the remedy, must materially increase the annual expenditure on account of the Canal.

13. A very important point was brought under notice by Colonel Galloway, namely, the effect which the opening of the Salt Water Lake by means of Canal into the Hooghly, would have on the salubrity of the City, and the general health of the poorer classes in particular, who depend for their supply of water on the River. "The water on the Salt Lake," Colonel Galloway observes, "is within a few degrees of being as salt as that at Saugor—That Lake and the Canal are the common Cess-pools of this immense City, consequently the quantum of salt water, and impurities of the most offensive description brought into the River by an ebb of so long duration, (at certain seasons constant) must be very great. The poorer inhabitants of Calcutta are obliged to have recourse to the River for their water. That water will then be a brackish mixture contaminated with the filth of the Calcutta Drains, for coming into the River on the same side and just above the Town. The water from the Canal will float down the verge of the Bank for a great distance without even mingling with the stream, and thus keep its position in shore where alone water is accessible to the inhabitants and to the crowded population afloat in Boats along the side of the River."

14. We trust however that the small quantity of water which it may be necessary to admit from the Lake, will not have "any sensible effect in communicating the saline properties of the former to the River water consumed by the inhabitants of Calcutta."

15. It would appear from a Sketch submitted by Colonel Galloway, that whenever the River, the level of which is during eight months in the year considerably below the level of the Lake, "is admitted into the Canal, so as to raise the water in the Canal one-half feet "above the level of the Lake, that there will commence obstruction to the Narkuldanga "Drain, and so to the other Drains according to their levels. It is manifest equally that in "the freshes of the rains the bottom of that Drain will be 11 feet under the surface of the "River, and that all the Drains will be submerged all of them several feet. Thus it is "demonstrated that the water of the River cannot be admitted into the Canal without "limitation."

16. It is therefore manifest, that great caution is necessary in uniting this Canal with the Hooghly so as to avoid the inconveniences here pointed out.

17. We think, under all circumstances, you decided judiciously in sanctioning the Lock suggested by Mr. Prinsep, which it appears may be used without materially increasing the height of the Canal water. The estimated cost of this Lock is Rupees 50,000.

18. Colonel Galloway calculated that the Lock having only a single chamber, it would be necessary to keep the Gates constantly shut, and that, in that case, only 48 Boats could be passed in one day, and this circumstance alone would impede the navigation and decrease the usefulness of the Canal.

19. We hope it will prove that a greater number of Boats than he supposed may be passed in a day, but at all events, as stated in Mr. Macnaghten's Letter, of the 12th June, 1832, the Lock might be so constructed as to admit of a second chamber, should the inconveniences contemplated by Colonel Galloway eventually arise.

20. We regret to observe by your subsequent proceedings, that an accident occurred at the Lock during an experiment which was made to try the effect of the water from the Hooghly in clearing the Shoals of deposit by which considerable damage was done to the Gates, which appear to have been imperfectly secured, and which involved an expence for repair estimated at Rupees 1,200.

21. The experiment however proved that the current is not sufficient to dissipate the sediment collected by the Drains, and it is proposed as an auxiliary for effecting this object, to make the section of the Balliaghatta Canal equal to that of the Circular Canal, previously to which however, it was considered expedient to excavate the Bunds in the bed of the Circular Canal, which you sanctioned at an estimate of Rupees 2,000.

22. The expenditure that is absolutely necessary to render practically useful such works as have already received our approval, is unavoidable, but you will be specially careful to limit your sanction of any estimates submitted to you, to works of this description.

23. The communications of Captain F. Jenkins, imparting the result of his observations on passing through the Sunderbuns and Eastern Canals, are interesting, and appear to contain useful suggestions, some of which we think might be advantageously adopted with a view to increasing the facilities afforded for carrying on the extensive traffic by means of these Canals.

24. We regret to find that you were deprived of the able services of Mr. James Prinsep, the Superintendent of Canals, by reason of his refusal to certify his accounts on honor, a rule to which it was not competent in you to pass an exception in his favor.

25. We perceive that you have appointed Captain John Thompson, of the Engineers, to the situation of Superintendent of Canals, in the room of Mr. Prinsep, and Agent for the construction of Suspension Bridges, vice Captain Baker, on a consolidated allowance of 600 Rupees per month.

26. Captain Thompson is said to possess considerable talents and science as an Engineer Officer, and we trust that he will efficiently discharge the duties attached to these important situations.

27. In our dispatch dated the 10th November, 1830, in which we took into consideration the proposal of the late Governor General to change the original plan of the Eastern Canal, by making it pass to the Westward of the Salt Water Lake instead of through it, we directed you in the event of your undertaking the work, to be specially careful "to obtain the most absolute accuracy in respect of the soil and the levels."

28. We desire to be informed if those directions have been attended to, and what are the results.

LONDON :
The 18th January, 1837.

We are, &c.,
* * * * *

(True Copy.)

W. H. MACNAGHTEN,
Secretary to the Government of India.

No. 448.

No. 26.

FROM CAPTAIN JOHN THOMSON,
Superintendent of Canals,

TO THE SECRETARY MILITARY BOARD.

Calcutta : 8th July, 1837.

SIR,

In order that I may reply clearly to your Letter No. 1142, of the 30th June, and to your communication received about the same time, I have added the following returns : A return (A.) of the daily average number of Boats which passed through the Locks, when they were alternately open and shut for a few days at a time. A return (B.) of the number of Boats which have passed through the Locks since the Canal was opened to the present time. A return (C.) of the number of Boats, about 25 maunds burden, which have passed through the Chitpore Locks for the month of April, distinguishing those which have entered at Chitpore, from those which have entered the Canal at Dhappa. Register (D.) of the opening and shutting of the Lock-Gates from 1st August, 1835, to the present time.

2. The months for which return (A.) is made are much more favourable than any other which I could have selected since the opening of the Canal, for judging of the preference given by the boatmen to passing through the Locks when they are open or shut, it appears there is scarcely any difference in the averages, but such as there are would lead to suppose, that the boatmen preferred being Locked through. In the dry season however, the current is not near so rapid as at present, and if a comparison could have been made at that season, I have no doubt but that the preference would be given to the open gates. There exist at present some practical difficulties to tracking through the gates which I shall endeavour to remedy next year. The greatest number of Boats that have passed through the Locks when closed in any one day is 130 on the 24th March last, and the burthen of the Boats was larger than usual, on this occasion, 4-5ths of the Boats passed out of the Canal, and I calculate that the number of times the Locks were filled and emptied in 14 hours' work was 65 times. If the Locks were worked with a double set of Classies, night and day, I believe them capable of Locking through 250 Boats in the day, the total burthen

country beyond is being cleared. Small villages are rising, and two or three residences of the European Grantees have been built, being signs of the improvement of the country.

10. *The Chultabarea and Bhangor Canal*, a Channel dug, which at low water is impassable from the silting of the bed, the width has somewhat contracted too from its original width of 110 feet by the deposit and sliding of the Banks, after a course of 17,000 feet it joins.

11. *The Gooneemagee Canal*, after crossing a portion of the Bejadaree Khal, which was widened by Captain Prinsep, and incorporated with what now forms the Gooneemagee and Bhojdigee Canals, the best Channel on the line, runs through stiff soil for 17,000 feet, has 6 feet water at low-tide, is generally in good order, requiring merely petty repairs to the Banks. On this line is a Ferry and Fishery, yielding an annual revenue of 91 Rupees.

There are Fisheries at Bhangor and Chultabarea, yielding 250 Rupees together per annum.

Rent of Fisheries. At the Western termination of Gooneemagee Canal, is about 200 feet of old Channel, joining it to—

12. *The Bhamungatta Canal*, a Channel of 14,000 feet in length, but only 75 feet wide, the original dimension: there is a towing embankment for the whole length, except about 2,000 feet, which require to be completed, and the brushwood removed from the Bund and space between the Bund and water. There is sufficient depth of water at all times for the navigation.

13. Turned off at the Eastern mouth of the Baliaghata Canal, and proceeded down the Tarda Channel, towards the North-Eastern end of Tolly's Nullah, which is not more than 80 feet wide, to Guriah Hath, and in many places only $1\frac{1}{2}$ foot water at low tide, causing thereby detention to the large class of Boats.

14. The repairs to the Guriah Hath Bridge, authorized to be commenced on, in Military Board's letter No. 7921, of 11th April, are in progress, and the passage over the Bridge closed from 24th instant. The Estimate was submitted with my No. 347, of 22nd April 1843, to your address.

15. The Eastern Bank of the Nullah, North-East of the Bridge, for 500 or 600 yards is precipitous, and the rise of the bed may be partly attributed to the sliding or crumbling of the Bank, as the base, which is soft mud, gets undermined. I would point to the benefit likely to be derived from sloping the Bank to the rear, both above and below the Bridge, where intervals between houses exist, which can be done when the Dredging is in progress, and which, I imagine, to be in contemplation. At and near Bustumghata are particularly objectionable spots, and many large trees overhanging the undermined Bank, the removal of some I have directed, which had partly fallen, but so great is the number of these on the brink, which the next rains may overturn, that I solicit authority for their removal, and sale partly to cover expence.

16. It appears to have been the practice for the owners of Boats for the purpose of repairs to the same, (and for which purpose they have permission to remain in the Canal a reasonable time) to excavate the Bank into large basins as temporary Docks, throwing the earth from the same into the Canal. I need not point out the excessive injury to the Banks by this practice, and how unchecked the abuse of the license to remain has been; in 10 or 12 instances the excavations are about 30 feet diameter, and 5 feet deep.

I have issued the following orders, viz. that those Boats now under repair shall not be removed till their owners have filled up the basins they dug, and that if after completion of the repairs of the Boat, the repairs to the Banks do not immediately take place, demurrage will be charged at the usual rates. I am quite satisfied that the extent of the damage was not

reported to the Superintendent by the Jemadar,—both he and the Peons of the establishment appear to have been very indolent in not properly traversing the line of the Canal with a view to prevention of injury.

I have further refused all applications from others to repair Boats in the Canal till the present damage has been repaired.

17. Between Tollygunge and Kamapohkurea, whence a small Nullah takes a Southward course, a complete bar has been formed, which is 2 feet above the level of the rest of the Channel; here the flood from the small Nullah meets that in Tolly's Channel, and though a piled Bund was formed by Captain Thomson in the small Channel, with a view of gaining an increased velocity to carry off the deposit, yet the effect of that Bund has been to widen the Channel of the branch Nullah at the expence of the Main Channel, by washing away the banks of the former and depositing the earth in the bed of the latter, this has been in progress for some time, and each succeeding year will increase the bar. I recommend therefore the removal of piled Bund (which, though falling to pieces, is sufficient impediment to cause mischief,) and the correction of the slopes of the Banks, to prevent further deposit from them.

18. Of several stakes which have been driven in to preserve the North Bank of Tolly's Nullah below Kamapohkurea, about one-third have fallen towards the water, they were not stout enough. The soil being so very soft, the sloping of the Bank to the rear at an acute angle with the horizon, will, I think, tend more to prevent deposit and preserve the banks than the light stakes above-mentioned, and I therefore have the honor to solicit instruction on that subject.

At old Tollygunge again are several trees whose roots are undermined, and which should be removed to prevent the probability of their being washed into the Canal, these are principally on the North Bank, whilst similar injury has been done to the Banks to that before mentioned by excavations for repair of Boats.

19. The Tollygunge Suspension Bridge wing-walls each present an ugly fissure, commencing at the base where the back chains produced would meet a horizontal line, and continuing irregularly up to the parapets, the NE. and SW. walls are more severely cracked than the others, the openings below being an inch and a half wide.

It is difficult to assign the cause, if the retaining masonry is connected with the wing-walls. I should say the chains have dragged, if not, the settlement has been in the wing-walls, if the former is the case, the back chains should be inspected. I have the honor to solicit permission to open one of the walls for that purpose, and for which but a small quantity of masonry need be removed.

The parts of this Bridge have been badly arranged, having been one of those early constructed, the railing is in the same plane with the chains, and consequently has been necessarily incomplete at the centre of the Bridge where the chain dips below the level of the hand rail, this is a fault, because when properly designed, a railing gives much rigidity to the platform, which is a desideratum in such structures.

A longitudinal iron strap, passing under the beams and upheld by the drop bars, has been much bent in several places, and several of the roadway beams are not at right angles to the axis of the Bridge, leading me to suppose that they have been shifted by a violent agent which may have also caused the before-mentioned fissures. The bolts are nearly $\frac{1}{4}$ less than the bolt holes, allowing too much play.

20. The Kaleeghat Suspension Bridge is in good order, the approaches require constant looking after : being exceedingly steep.

The arched foot Bridge at the Alipore Jail, the Alipore, Kyderpore and Hasting's Bridges, are in good order, with the following exceptions. The abutment of the Alipore Bridge exhibit settlement, but no symptom of the Alipore Bridge abutments.

toms of importance, and the Kyderpore Bridge abutment on the North side has also settled, the vault of the guard room under the approach having cracked in consequence, and leaks.

22. The rush of the tide past the Iron yard is making great encroachment on a bay Bank of Iron yard cut away by just above Bridge, and endangering the overseer's house, as the current effects of another year or two may cause heavier expence, I would recommend the construction of a dam across the small bay for the protection of the Bank, and for the purpose of reflecting the current.

23. The Government Bauleah is in such a very delapidated state, that it has become quite unserviceable. It leaks very much, and the deck planks and Bauleah. roof are rotten. I would recommend her immediate sale, as repairs would cost more than the purchase of a new Paunsway, which could be fitted up in the yard to serve all purposes for which it may be intended.

24. Thus having completed my report on the Canals, I have the honor to recapitulate the items for special consideration, and points on which I request instruction, and as there never have been any Annual Estimates for repairs to the Bridges and Canals, the works necessary to the Chitpore, Barrackpore, Dum-Dum and other Bridges on the Circular and Balinghata Canals, referred to in paragraphs 2, are in progress, and will be charged in the Current Expence Bills.

I have the honor to be,

Sir,

Your most obedient Servant,

H. GOODWYN,

Capt. Engineers, Officiating Superintendent of Canals.

Recapitulation or Abstract of Works referred to as required.

1st. The clearance of jungle, and repairs to the Towing-paths and Banks of the Eastern Channels which were opened at the expence of Government, and on which an annual outlay of 500 or 600 Rupees was formerly expended.

2nd. Sloping off the Banks of Tolly's Nullah in such places, as from their precipitous and crumbling nature they cause deposit with the removal of and sale of trees overhanging the Banks, and are likely to be swept in.

3rd. Sanction to my instructions reported relative to the digging of basins for repairs of Boats, and injury to Banks of the Canal.

4th. Removal of piled Bund in the Kumapohkuriah Khal, and stakes from opposite Bank forming proper slopes to Banks.

5th. Examination of the wing-walls of Tolly Gunje Suspension Bridge.

6th. Construction of a Dam to prevent damage to Overseer's House in Iron yard, and to protect the Banks of Canal from further encroachment of the current.

7th. The proposed sale of Government Bauleah and purchase of Paunsway.

(NOTE A.)

With reference to the remark on the standards of the Ooltadunga Bridge, I beg to offer the following remarks, to show the consequences likely to arise from unequal pressure, by the position of the chain as in that Bridge.

In the annexed figure, if P represent the power necessary to separate the particles in BEFG, the proportion of strain will be AG : AB ::

$$P : W \text{ or } \frac{AB \times P}{AG} = W.$$

So that if the point G be only 1-6th part out of the centre, then $\frac{6 \times P}{4} = 1\frac{1}{2} P = W$, or

the portion AGFD will be only exerting one-half its power of resistance when the portion GBEF breaks away, whereas, if the line GF bisected the rectangle, then W would be equal 2 P.

The effect of the unequal pressure will be to force the weakest side B into a curve, and it will have a tendency to such figure till AG and GB be equal, if rupture does not ensue before.

This is a point which has been so little considered in construction, that settlements are often pronounced to be what is in reality the effect of the variation of the load from the centre of magnitude.

An elastic body would, in a moment, point out the effect of inequality of compression, what must be the consequence, therefore, on a body which allow of compression without restoration of its figure?

The pressure by the heavy load of a Suspension Bridge, perpendicularly on a Pier, is quite sufficient to produce the effect alluded to in brickworks, unless sufficiently counteracted by an arch or tie, affording resistance to the irregularly compressive power.

H. GOODWYN, *Captain,*
Engineers.

(No. 756 omitted.)

No. 757.

No. 988.

FROM THE SECRETARY TO THE MILITARY BOARD,

TO THE SUPERINTENDING ENGINEER,

South-Eastern Provinces.

6th June, 1843

SIR,

In acknowledging the receipt of your letter No. 105, of the 11th May last, submitting a report from Captain Goodwyn, on the state of the Soonderbund Canals and Iron Suspension Bridges, I am directed by the Military Board to request you will desire Captain Goodwyn to submit an Estimate for putting the Tow-paths, &c. of all Moffusil Canals alluded to in the 5th, 6th, 7th, 8th, 9th, 10th, 11th and 12th paras. of that officer's present communication, into a good state of repair, as suggested by you, and in future an Estimate should be annually submitted for such repairs as may be deemed necessary by the Superintendent.

2. With reference to the 4th para. of your above communication, the Board authorize you to desire the Superintendent to provide in an annual Estimate for the petty repairs required to the Bridges and Toll Houses.

3. In regard to the Ooltadangah Bridge, the Board approve of your remarks, and request you will call on Captain Goodwyn to furnish the information required in the 6th para. of your present letter.

4. With reference to the 9th para. of your letter under reply, relative to the excavation or closing of the Gobra Khall, the Board wish Captain Goodwyn to state, what the expence would be to execute the above work.

5. The Board approve of the instruction issued in the 15th and 16th paras. of Captain Goodwyn's Report, in regard to the removal of the trees on the Banks of Tolly's Nullah and the cutting of Docks for repairing Boats.

6. An Estimate should be prepared for putting the Kamarapookerrah Bund into an efficient state of repair, and as this work is close to Calcutta, the Board wish it for the present to be visited monthly, and a report to be furnished of its utility or the reverse, as the case may appear to the executive officer and yourself.

7. The Board await Captain Goodwyn's report on the state of the wall of the Tolly Gunge Bridge, and approve of your recommendations suggested in the 14th, 15th, 16th and 17th paras. of your above letter.

I have, &c.,
(Signed) H. DEBUDE.

No. 758.

No. 124.

FROM CAPTAIN H. GOODWYN, *Engineers*,
Offg. Collector of Tolls,

TO MAJOR H. DEBUDE,
Secretary Military Board.

Calcutta : 6th July, 1843.

SIR,

There is a village about a mile up the Kamrapokria Khâl, near the Russa Station, or Tolly's Nullah, from which is a Road direct to Kyderpore, and advantage of which is taken by many Canoes or Dongahs to unload cargoes to be transported to Kyderpore from the above-mentioned village, and which bears the same name as the Khâl. These boats, as they do not proceed to the junction of the Khâl with Tolly's Nullah, avoid the toll which would otherwise be due.

2. I beg to offer for consideration the question of the propriety of establishing a subordinate Station of one Mohurir and one Chuprassy at this point, for the purpose of collecting the dues, which I am led to suppose, will not be less than 500 Rupees per Annum.

I have the honor to be,

Sir,

Your most obedient Servant,

H. GOODWYN, *Captain, Engineers*,
Offg. Collector of Tolls.

No. 759.

No. 1762.

FROM THE SECRETARY TO THE MILITARY BOARD,
TO THE OFFICIATING COLLECTOR OF TOLLS,

Calcutta Canals.

SIR,

15th July, 1843.

I am directed by the Military Board to acknowledge the receipt of your letter dated the 6th instant, and to state, that unless the unloading of Canoes at the village of Kamapokreea, is likely to affect the amount of Tolls received to a much greater extent than 500 Rupees a year, the Board would not wish on this account to establish a new Chokey at the point mentioned.

I have, &c.,
(Signed) H. DEBUDE.

No. 760.

No. 84.

FROM CAPTAIN H. GOODWYN, *Engineers,*
Offg. Collector of Tolls,

TO MAJOR H. DEBUDE,
Secretary Military Board.

SIR,

Calcutta : 14th June, 1843.

In submitting the account of Toll Collections for the past month, which I beg the Board will notice, are Rupees 699-2-0 in excess of the same month of last year. I have the honor to lay before the Board the following measures which, upon mature investigation, I find will be the only effectual ones for remedying the great loss to the Revenue arising from the destruction of half Tickets, upon which demurrage or tolls are due, often to a considerable amount. During the past year no less than 2,862 Tickets have been lost; involving, perhaps, a deficiency of Toll revenue of Rupees from 8 to 10,000 Rupees in the whole year.

2. I will first point out what I have ascertained to be the causes of embezzlement of the Tickets, that the Board may be aware of the utility of the proposed arrangement.

3. There are about one hundred Auruthdars or Agents on the Baliaghata, Circular and Entally Canals, to each of whom, on an average 150 Boats are monthly consigned. These are the principal persons through whom the loss of the Tickets arise, as many of the Boats being of large Tonnage and heavily laden, they allow the merchandize to remain in the Boats, and thereby accumulate a large sum for demurrage. The following are some of the means adopted by these people for passing their Boats out of the Canal.

4. First, With Tickets of other Boats of equal measurement that may not have incurred demurrage. Secondly, By purchasing old Tickets (from the Mohurir, Chaprassy, or persons who collect Tickets at the Toll Chowkey) of Boats of equal Tonnage, for half or less than half of the Toll originally paid by the former holder of the Ticket. Their own Ticket is then destroyed.

5. A Boat coming into the Canal may obtain a correct Ticket perhaps to the value of 10 Rupees, but the check forwarded to the office, in many instances, may show but 10 annas; the Ticket on its return to the person from whom he got it, is destroyed to prevent detection.

6. Boats often are broken up for firewood, on which, from the time they have been in the Canal, a large amount of Demurrage is due, but many of these have no Tickets, and the Jemadar, on receipt of a present, will then only forward to the office the number of Tickets he gets, though that may be only equal to one-half the number of Boats.

7. The Agents are, however, the great causes of the roguery, and the loss of Revenue, and the instigators of the deceit practised, and should therefore be made the responsible persons, and answerable for the loss of Tickets. The amount due on which, I propose to ascertain by the following means, which, though simple, will, I think, be effectual, and I hope meet with the approval of the Board.

8. Each Agent has his own Khalgushtie, or person who pays toll and receives Ticket for his employer's Boats. These men at present are unknown to the Toll Darogah as the authorized Agents, their very names are unknown, and consequently they escape responsibility.

I propose that they should show a Certificate from the Auruthdar who employs them. So worded as to hold the Auruthdar alone responsible for the acts of the subordinate: the originals of these to be kept in this office, and copies furnished to the Darogahs.

9. The Tickets, as now framed, bear only the name of the Mangee, who, even if the wilful loss of his Ticket is discovered, is not able to bear the loss nor pay the amount due. The Tickets henceforth to have the name of the Auruthdar on them, as certified by the Khaigushtie, and written by the Darogah, who, when the Tickets are returned, will give the Auruthdar a receipt for the same.

10. In the event of loss of Ticket the Agent's name is thus known, and if he cannot produce the Darogah's receipt, he becomes immediately responsible and punishable, and so likewise on the other hand, does the Darogah, if the Auruthdar produces the receipt and the half Ticket be not forthcoming.

11. That the present two Jemadars and some of the Peons on the establishment have connived at the loss of the Tickets I am quite sure. I think it would be advisable to commence the new system with men for whom the Darogahs themselves will be responsible and give security, and who have no connexion with the Auruthdars, for as these men are checks on the proper collection of the Tolls, their characters should be as good as the nature of things will admit of.

12. I beg to annex a facsimile of the new Ticket, and to solicit the sanction to the measures proposed, and though consistently with the present heavy duty in the Iron yard, I will exert all means to advance the interests of the Government. I beg to assure the Board, that instead of the Iron Bridge yard being a secondary item of my appointment, it occupies three-fourths of my time unceasingly, and to my Toll and Canal works I devote all that is to spare, and they too require watchful superintendence.

I have the honor to be,

Sir,

Your obedient Servant,

H. GOODWYN *Captain Engineers,*
Offg. Collector of Tolls

No. 760. a.

Facsimile of proposed new Ticket

ধাপা চৌকি ...	...	...	...	...	Dhapa Chowkee.
নম্বর ...	...	...	...	...	Number
কুত ...	...	...	...	...	Maundage
আড়তদার ...	...	...	...	...	Auruthdar.
মাজি ...	...	...	...	...	Mangee.
প্রবর্ত ...	...	...	...	...	Entered
গিয়াছে ——— দিন ...	...	...	...	...	Went out ——— days

H. GOODWYN, *Captain,*
Offg. Collector

No. 761.

No. 1782.

FROM THE SECRETARY TO THE MILITARY BOARD,

To CAPTAIN H. GOODWYN,

Offg. Collector of Tolls.

SIR,

15th July, 1843.

I am directed by the Military Board to acknowledge the receipt of your letter No. 84, of the 14th ultimo, and in reply to request, that a trial be given to the system proposed by you for putting a stop to the embezzlement of Toll Tickets.

I have, &c.,

(Signed) H. D.

(No. 762 to No. 767 inclusive, omitted.)

No. 768.

No. 1247.

FROM THE SUPERINTENDING ENGINEER,

South-Eastern Provinces,

To THE SECRETARY MILITARY BOARD.

SIR,

Calcutta : 11th August, 1843.

Adverting to the 1st and 4th paras. of your letter No. 988, dated the 6th June last, I have the honor to submit the enclosed Estimates received 22nd ultimo, with Captain Goodwyn's letter No. 184, of that date, accompanied by a sketch.

Estimate No. 6, by Captain Goodwyn, Officiating Superintendent of Canals, of the probable expence of cutting Jungle, repairing and remaking Tow-paths, damming Cuts and completing the tracking communication along the Eastern Canals, amounting to Company's Rupees 4,365-11-10.

Estimate No. 7, by the same officer, of the probable expence of damming up the Gobrah Khall, amounting to Company's Rupees 5,347-6-0.

2. The work detailed in the first of the above Estimates is, I think, necessary for the improvement of the navigation of the Sunderbund Canals, and I therefore beg to recommend the estimate for sanction. The rates, considering the part of country where the work is to be done, are not unreasonable, and on this account I make no objection to 10 per cent. being charged for contingencies.

3. With respect to the second Estimate for closing the Gobra Khall, although if successful, a beneficial work, yet I am so doubtful of its being successfully accomplished for the amount mentioned, that I would wish the estimate to be held over* till a more favorable season will admit of both Captain Goodwyn and myself becoming better acquainted with the difficulties attendant upon this work ; any delay that may occur in its execution if ultimately approved of, if it tend to the probability of a more successful result, as it doubtless will, will be more satisfactory in the end than commencing the operation with inadequate information, and perhaps inadequate means.

I have the honor to be,

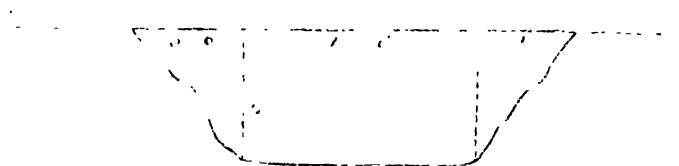
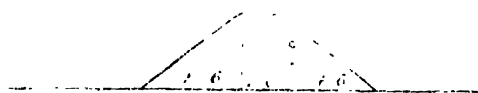
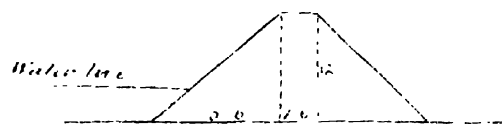
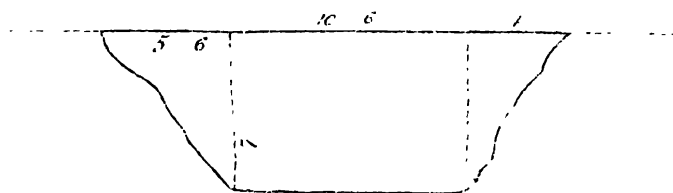
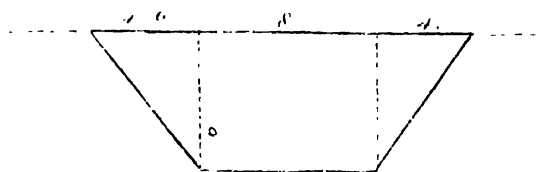
Sir,

Your obedient Servant,

W. R. FITZGERALD, Major,

Supg. Engineer, South-Eastern Provinces.

* See Appendix
J. No. XXXVII.
No. XXXVIII.—
J. M.



No. 768. a.

CANAL DEPARTMENT

Estimate No. 6.

Estimate framed by CAPTAIN GOODWYN, Engineers, Officiating Superintendent of Canals, of the probable expence of cutting Jungle, repairing and re-making Tow-paths, and by damming Cuts, completing the tracking communication along the Eastern Canals, with reference to orders of Military Board, contained in Superintending Engineer's No. 533, of 12th June, 1843.

Calcutta . 30th June, 1843

SPECIFICATION

Husinabad Canal. From its junction with the Eshamutty River to its junction with the Dossah Khall is 9,660 feet in length. The height of its Banks vary from 3 to 14 feet, and the Tow-path is on the South Banks.

5,280 running feet is to be repaired ; 5,060 running feet $\times$ 30 feet of Jungle is to be cut, it abounds with large trees ; 3,610 feet in eight different places are entirely cut away by the water of the adjoining lands running over the Banks into the Canal, the Zemindars have made a small Bund about 2 feet 6 inches high, by 4 feet at bottom, and 1 foot at top along these parts, about 100 feet in rear of the original Bank : should these be repaired, 1,100 feet will have to be piled to secure the Bund or Tow-path after it is made ; the breadth of three Nullahs will have to be closed with a substantial Bund and Tow-path made over them, these Nullahs measure only from 40 to 50 feet in width, and from 5 to 7 feet in depth, they were cut by the Zemindars to drain their lands, and after the purpose for which they were cut was accomplished, the Zemindars formed a Bund about 150 feet in rear of the original point.

640 running feet of the Bank close to its junction with the Eshamutty being extremely high, has been greatly cut away by the current, it should be piled with Soondry stakes to secure the remaining part of the Road.

Bayley Gunge Canal. From its junction with the Dossah Khall to its junction with the Gobra Khall is 7,500 running feet in length—jungle 30 feet in width to be cut ; the whole length 700 feet of Tow-path must be re-made, as very little of the original one can be seen.

Bhowaneepore Canal. From its junction with the Gobra Khall to its meeting with the Taintoo Khall is 11,440 running feet in length—7,400' $\times$ 30' of jungle to be cut, 9,490 feet of Tow-path is to be partially repaired, 620 feet the breadth of two Nullahs will have to be piled with Soondry stakes, and a Bund made so as to allow a free passage for tracking, they have been occasioned by the water of the adjoining lands running into the Canal over the Bank, one Nullah measures 220 feet, the other 410 feet, the length of 5 slips will have to be piled to secure the remaining part of the Tow-path ; 130 feet in two places has been cut by the Zemindar and Tunnel Drains made for the purpose of draining their lands ; about 40 feet back from the water the tracking can be carried on over them, but 740 feet of Tow-path will have to be made, as the Bank here is on a level with high-water, and in some places below it. Two Docks have been cut by the Zemindar (one measuring 20' $\times$ 15' the other 30' $\times$ 20') to keep his Boats in, they should be closed without fail, as it has been done without orders.

Taintoo Khall. The length of it is 5,000 feet jungle, 30 feet in width to be cut, and a Tow-path made the whole length, as nothing of the former Tow-path can be seen.

A Nullah 50 feet wide is to be closed.

Choytol Basrah. Its length is 300 feet jungle, 30 feet in width to be cut, and Tow-path partially repaired the whole length ; a Nullah 20 feet wide will have to be closed.

Bhangur Canal. Its length is about 12,000 feet, 140 feet of Tow-path will have to be made as this length of the Bank is under water ; eight Nullahs cut by the Zemindars for draining their lands will have to be closed, they measure as follows :—two of 5 feet each, two of 15 feet each, two of 20 feet each, and two of 10 feet each.

Bhojdigee Canal. Its length is 6,700 feet jungle, 5,500 feet $\times$ 30 feet to be cut on the South Bank ; 500' $\times$ 30' of ditto to be cut on the North Bank, this space is 2 feet under water, 4,400 feet of Tow-path is to be made, as nothing of the former one can be seen ; the Banks 80 to 100 feet from the water are high and good, but the Tow-path cannot be removed to such a distance, for it will obstruct tracking greatly. The Tow-path along this Canal to the distance of 1,200 feet is on the North Bank, the rest on the South Bank.

Ghonee Magee Canal. Its length is about 12,000 feet, the Tow-path is in good order, two Nullahs occasioned by the falling of water over the Bank into the Canal will have to be closed, one measures 30 feet wide, the other 20 feet.

Bentah, portion of above Canal. Its length is 5,000 feet, the Tow-path is in good order, 3,000' $\times$ 15' of small jungle is to be cut.

Kataltollah, another portion of above Canal. Its length 7,800 feet, of which 1,000 feet has never had any Tow-path, the rest of the Tow-path is in good order ; 5,000' $\times$ 20' of small Jungle is to be cut 80 feet wide, one Nullah will have to be closed, and one slip, 200 feet in length, will have to be piled to secure the remaining part of the Tow-path.

Bhamunghattah Khall. Its length is 2,200 feet jungle, 50 feet wide to be cut to enable the earth to be got for the Tow-path, and a Tow-path is to be made the whole length, as nothing of the former one can be seen.

General Section of renewed Tow-path to be

MEASUREMENTS.	Cubic feet of Tow- path.	Cubic feet of falling Cuts.	Superficial feet of cutting Jungle
<i>Husunabad Canal</i>			
Renewed Tow-path $\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 3,600$.	75,600,		
Tow-path over Nullahs, ... 21 $\times$ 130 .	2,730,		
Total cubic contents Tow-path, ...	78,330		
Cuts to be closed total length 130 feet.			

Section.

$\frac{20 + 10\frac{1}{2}}{2} \times 6 \times 130 =$..	..	..	11,895	
Jungle to be cut, ... 5,060 $\times$ 30 = ..	..	..	..	151,800
<i>Bayley Gunge Canal.</i>				
Tow-path to be renewed, Section as above.				
$\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 700 =$	14,700	..	..	
Jungle to be cut, ... 7,000 $\times$ 30 = ..	..	..	..	225,000
Carried over, Co's. Rs.	93,030	11,895		376,800

CCCC

<i>Bhowanipoor Canal.</i>		Cubic feet of Tow- path.	Cubic feet of falling Cuts.	Superficial feet of cutting Jungle.
Brought forward, ..		93,030	11,895	376,800
Cuts to be closed, total length 620 feet.				
Section.				
$\frac{16\frac{1}{2} + 8}{2} \times 6 \times 620 = ..$			45,570	
Jungle to be cut, .. 7,400 $\times$ 30 = ..				222,000
Temporary Docks filling.				
L. B. D.				
One 30" $\times$ 20" $\times$ 4 = 2,400				
One 20 $\times$ 15 $\times$ 4 = 1,200				
Total cubic feet, ..			3,600	
Area. Length.				
New Tow-path $\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 740 = ..$		15,540		
<i>Taintoo Khal.</i>				
Jungle to be cut, .. 5,000 $\times$ 30 = ..				150,000
New Tow-path $\frac{10\frac{1}{2} \times 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 5,000 = 105,000$				
Ditto over Nullah, .. 21 $\times$ 50 = 1,050				
Total, ..		106,050		
Cut to be closed Section.				
$20 + 10\frac{1}{2} \times 7 \times 50 = ..$			53,375	
<i>Choytol Basra Canal.</i>				
Jungle to be cut, .. 3,000 $\times$ 30 = ..				90,000
<i>Bhangur Canal.</i>				
Cut to be closed, Section same as above.				
$\frac{20 + 10\frac{1}{2}}{2} \times 7 \times 100 = ..$			10,675	
New Tow-path over Bund $\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 100 = 2,100$				
New Tow-path on Bank, .. 21 140 $\times$ = 2,940				
Total, ..		5,040		
<i>Bhojdigee Canal.</i>				
Jungle to be cut, .. 6,000 $\times$ 30 ..				1,80,000
Tow-path of Section.				
Area. Length.				
$\frac{12\frac{1}{2} + 1\frac{1}{2}}{2} \times 5 = 35 \times 4,400 =$		154,000		
Carried over, Co's. Rs...		373,660	125,115	10,18,800

<i>Goneemagee Canal.</i>	Cubic feet of Tow- path.	Cubic feet of falling Cuts.	Superficial feet of cutting Jungle.
Brought forward, ..	373,660	12,5115	10,18,800
Cuts to be closed, Section as above. $\frac{20 + 10\frac{1}{2}}{2} \times 7 \times 50 =$	..	5,3375	
<i>Beanlah Canal.</i>			
Jungle to be cut, ... 3,000 $\times$ 15 = ...	..	..	45,000
<i>Kataltollah Canal.</i>			
Jungle to be cut, ... 5,000 $\times$ 20 = ...	..	..	1,00,000
Cut to be closed, Section as above. $\frac{20 + 10\frac{1}{2}}{2} \times 7 \times 80 =$	..	8,540	
<i>Bammunghata Canal.</i>			
Jungle cutting, ... 2,200 $\times$ 50 = ...	..	..	110,000
Area.			
New Tow-path $\frac{10\frac{1}{2} + 1\frac{1}{2}}{2} \times 3\frac{1}{2} = 21 \times 2,200 =$..	46,200	..	..
Total Measurement, ...	4,19,860	90,955	12,73,800

Abstract.

4,19,860	Cubic feet new Tow-path or 575 Chowkas, at 2-4 per chowka,	1,293	12	0
90,955	Ditto damming Cuts or 124 Chowkas, at 2-4 per Chowka, ..	279	12	0
12,73,800	Supl. feet of cutting Jungles, at 0-2 per 100 feet, ...	1,592	4	0
18,870	Cubic feet of Tow-path to be repaired, at 0-10 per 100 feet, ..	117	15	0
1,050	Running feet of piling to Banks, at 26 per 100 feet, ...	273	0	0
	Establishment and Boat hire for overseer, ...	100	0	0
	Total Co's. Rupees	3,655	15	0
	Add contingencies at 10 per cent., ...	365	9	6
	Grand Total, Co's. Rupees	4,021	8	6

H. GOODWYN, *Captain,**Offg. Superintendent of Canals.**Memo.—Salt Water Lake Tow-path.*

The whole length of the Tow-path made on the SW. Bank of the Salt Water Lake in the year 1833, is 7,100 feet, the Tow-path then made was 3' 6" high, 1' 6" at top and 10' 6" at bottom; but at present there is a Bund along this line which has been made by the Zemindars and Fishermen 3' 6" high, 1 foot at top and 3 feet at bottom, consequently this Bund will have to

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be increased to the original size of the Tow-path, as shown above: the shaded part is the present Bund, and the outer line the part to be added.

$\frac{7.6 + 6}{2} \times 3' 6" \times 7,100 = 99,400$ cub. feet or $136\frac{1}{2}$ Chowkas, at 2-4
per Chowka, ... 306 12 0
A wooden Bridge to be made across a Nullah to connect Tow-paths as
was originally done. The old Bridge being destroyed for want of repairs,
probable cost, ... 40 0 0

Total Co's. Rs. .. . 346 12 0
Above amount, .. . 4,021 8 6

Grand total, Co's. Rs. . . . 4,366 4 6

H. GOODWYN, *Captain,*
Offg. Superintendent of Canals.

No. 769.

No. 3193.

FROM THE MILITARY BOARD.

TO THE DEPUTY GOVERNOR OF BENGAL, &c.

9th September, 1843.

HONORABLE SIR,

We have the honor to submit the undermentioned estimate by Capt. Goodwyn, of the probable expence of cutting jungle, repairing and re-making Tow-paths, &c. of all the Moffussil or Sunderbund Canals, and to recommend that it be sanctioned. The estimate has been prepared under our orders, and the rates assumed in it are admissible.

We have, &c.,

J. H. P.
J. C.
R. B.
S. M. T.

No. 770.

No. 3194.

TO THE SUPERINTENDING ENGINEER,

South-Eastern Provinces.

9th September, 1840.

SIR,

In acknowledging the receipt of your letter No. 1247, of the 11th August last, I am directed by the Military Board to mention, that as they doubt the practicability of bunding up the Gobra Khall, with reference to former correspondence on the subject, they have desired me to transmit to you the accompanying original papers as per margin, with

Pro. 14th April,
1837, E.
Ditto 16th June,
1837, P.

a view to enable yourself and Captain Goodwyn to investigate the expediency of attempting to dam the Khall in question.

2. The Estimate for making improvements to the Sunderbund Canals, has been this day recommended to Government.

I have the honor to be,

Sir,

Your obedient Servant,

FORT WILLIAM, MILITARY BOARD OFFICE:
9th September, 1843.

(Signed) H. DEBUDE,
Secretary Military Board.

(No. 771 omitted.)

No. 772.

No. 302.

FROM CAPTAIN GOODWYN,
Collector of Tolls,

TO CAPTAIN G. T. GREENE,
Secretary Military Board.

Fort William : 4th December, 1843.

SIR,

In submitting the statement of Collections for the half-year ending 31st October last, on the Calcutta Canals, I have the honor to offer the following remarks relative to statement D.

Panspota Chowkee, Tolly's Nullah.

The decrease in the Collection from July to October is principally owing to the difficulty of getting large Boats through the Channel at low-water from the silting of the bed, and when forced over the sand, it was at much expence which obliged the Mohajuns to unload the large Boats, and transport the goods in dingees, and ultimately they removed their Agencies to the Balliaghatta Canal during those months.

Kidderpore Chowkee, Tolly's Nullah.

Coals being now largely used for brick-burning where wood in large quantities used to be used, has been one reason for the decrease of Tolls at this Chowkee, as also the low state of the markets for all sorts of country produce this season.

Balliaghatta Canal, Dhapa Chowkee.

The Collections for May and June were much increased, but afterwards a decrease in the number of Boats occurred owing to the very low price of wood, and from rice having been almost unsaleable, much caused from immense quantities being brought from the Eastward to the Kumrapokrea Khâl on Tolly's Nullah, above and beyond the controul of the Toll Chowkee. It is there crossed and brought in carts by hundreds to the Town, the Toll Duty being thus avoided.

Many rum-distilling establishments have no existence this year, so that but little molasses has come into the market, which last year came in large quantities.

With regard to missing Tickets I may observe, that the 317 unrecovered up to the 31st October, were of those issued previous to the issue of the new Tickets, in which the Auruthdar's names were inserted, which came into force during August subsequently, and that scarcely one has been lost since. This circumstance was brought to the notice of the Board in my letter No. 84, of the 14th June last, and is proof of the efficiency of the system, whilst it is satisfactory to me to be able to state, that the decrease in the collections has not been owing to other cause than the difference of traffic, whilst every exertion has been used to promote the Revenue interests, under circumstances extremely difficult.

I have the honor to be,

Sir,

Your obedient Servant,

H. GOODWYN, *Captain*,

Collector of Tolls.

FINIS

APPENDIX TO APPENDIX (H.)

Supplemental Papers.

No. I.

No. 1685.

TO THE RIGHT HONORABLE LORD WILLIAM CAVENDISH BENTINCK, G. C. B.,
Governor General in Council, &c. &c. &c.

Fort William.

Miscellaneous Department.

MY LORD,

With reference to the orders of Government, dated 29th November 1827, addressed to the late Presidency Board, directing that the Acting Commissioner in the Soonderbuns should depute proper persons to measure and value the ground at Baumunghatta required for the Eastern Canal, we have the honor to forward three Statements of the estimated value of lands and trees, including compensation for the removal of huts, and as we see no reason to object to that valuation, we request authority for the Commissioner to disburse the amount.

Statement No. 1 exhibits the value of lands, &c., in Pergunnah Augur- } 948 12 0
para and Myhatti, ... Total, .. Sa. Rs. }
Statement No. 2, ditto ditto in Pergunnah Calcutta, ,, .. , 7,805 0 0
Statement No. 3, ditto ditto in Pergunnah Pykehatti and Balindah, } 2,017 14 8
Total, .. Sa. Rs. }

1. Pergunnahs.	2. Malgoozaree Lands.		3. Lakheraj Lands.		4. Total, Value.
	Quantity.	Value.	Quantity.	Value.	
No. 1. { Augurpara, .. Statement, { Myhatti, ..	Chs. 12 0 Cts. 6 14 0 Bgs. 0 0 0	Rs. 360 0 0 As. 87 8 0	Chs. 19 12 0 Cts. 42 3 8 Bgs. 19 12 0	Rs. 501 4 0 As. 1,034 0 0	Rs. 948 12 0 As. 7,805 0 0
No. 2. { Calcutta, ..	20 0 0	447 8 0	42 3 8	1,034 0 0	
No. 3. { Jointly Pergunnahs Pykehatti, & Statement, { Balindah, ..	156 12 0	1,814 10 8	11 17 0	203 4 0	12,017 14 8
Grand Total, Sa. Rs. ..					10,771 10 8

Grand total, Sa. Rs. 10,771 10 8

2nd. An Abstract is inserted in the margin, showing the quantity of Land, Lakheraj and Malgoozarry, and value thereof in each Pergunnah.

3rd. From the subjoined copy of a letter from the Commissioner in the Soonderbuns, dated the 31st of January, it would appear, that the proprietors will be content to receive the proposed indemnification.

We have the honor to be, with respect,

My Lord,

Your Lordship's most obedient
and very humble Servants,

J. PATTLE.

W. BLUNT.

SUDDER BOARD OF REVENUE,

FORT WILLIAM:

The 14th April, 1829.

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No. I. a.

G. A. BUSHBY, ESQ.,

Secretary to the Board of Revenue, Lower Provinces.

SIR,

I have the honor herewith to forward the Statement No. 1, returned with your letter of the 9th instant, No. 126, duly corrected.

The Lands were valued according to the actual produce of the soil, and the rents received therefrom by an Officer of my establishment, specially deputed for that purpose, and I can only account for the Lakheraj Lands bearing so low a price in comparison with others, and the difference in value of various portions from the circumstances of their unproductiveness, many parts of the country through which the Canal passes being *putteet* and waste.

I have had numerous applications from the proprietors to receive the amount of their Lands taken for the Government purposes, but not one complaint has been made relative to the lowness of the rates fixed on them.

I have, &c ,

SOONDERBUN'S OFFICE :

(Signed) WM. DAMPIER,

31st January, 1829.

Commissioner.

CAMP COBADDUK RIVER.

SUDDER BOARD OF REVENUE.

(True Copy.)

G. A. BUSHBY,

Junior Secretary.

No. II.

No. 572.

TO SUDDER BOARD OF REVENUE.

Miscellaneous—Revenue.

GENTLEMEN,

The 5th May, 1829.

I am directed by the Right Honorable the Governor General in Council to acknowledge the receipt of your Letter, dated the 14th ultimo, with its enclosures, and in reply to communicate as follows,—

From the statements submitted by Mr. Dampier it would appear, that the only individuals to whom he proposes to assign a compensation for the land taken for the Eastern Canal, are the Zemindars of the Malgoozarree land, and the proprietors of Lakheraj land; of the latter it is presumed, that the owners are also the actual occupants, and in respect to them the payment proposed by the Commissioner seems unobjectionable; but in regard to the Malgoozarree lands, it is presumed, that they must have been in the occupation of ryotts, for whose interests, whether as regards their right of occupancy, the deduction in their rents to which they may be entitled, or the compensation for the removal of their houses and trees, no arrangements, as far as can be gathered from the statements, appear to have been made by the Commissioner.

Before authorizing the payment of the proposed compensation, the Governor General in Council desires that Mr. Dampier shall be directed to make a further enquiry into the above points, and in elucidation of the mode in which Government would wish his proceedings to be conducted, I am directed to refer your Board to a Report and Statement of Lands taken for the new Nagpore Road, the compensation for which was adjusted by the Collectors of Hooghly and Midnapore, and submitted to Government in Letters from the Acting Secretary to the late Board of Revenue, under dates the 25th July and 26th August 1823. On referring to those proceedings your Board will observe, that the interests of all parties, from the Zemindar to

the Ryott, were carefully provided for by the Collectors of the above districts: Mr. Dampier's attention may likewise be directed to the spirit of the Rule in Cl. 3, Sec. 6, Reg. I., 1824.

The necessary arrangements being made to secure the rights and interests of the inferior classes, His Lordship in Council is of opinion, that instead of purchasing the Mal-goozarree Land outright, the most expedient mode of compensating the Zemindars will be to allow to each a deduction from the Sudder Jumma payable by him to Government, equal to the amount of the net rent which he would have received for the land from his Ryotts.

For houses, trees, or other property of a similar kind, whether the same belong to Ryotts or Zemindars, a distinct compensation must of course be made—it will however be convenient to have a separate Statement furnished for those items

The original Documents which accompanied your Letter are herewith returned.

I have, &c.,

(Sd.)

[Secretary to Government.]

No. III.

TO SECRETARY TO THE GOVERNOR GENERAL,

Revenue Department.

Miscellaneous—Revenue.

SIR,

15th May, 1832.

I am directed by the Honorable the Vice-President in Council, to transmit for His Lordship's perusal, the accompanying Letter from the Military Board, No. 97, dated the 1st instant, submitting observations by Captain F. Jenkins,* on the new Canals in the Soonderbuns and on the Entally Canal.

* See Appendix to Appendix (H) No. 88, page liii.

I have, &c.,

(Sd.)

J. T.

[Deputy Secretary to Government.]

No. IV.

No. 2929.

TO JAMES THOMASON, ESQ.,

Deputy Secretary to Government, Revenue Department.

Revenue Department.

SIR,

I am directed by the Right Honorable the Governor General to return to you the Original Letter from the Military Board, submitted with your's of the 15th ultimo: the observations of Captain Jenkins, relative to the state of the new Soonderbun and Entally Canals, will remain for future consideration. In the meantime, the remarks contained in the 10th Para. of that Officer's report, seem to His Lordship to merit attention, if indeed the grants of waste Lands in the Soonderbuns do not already stipulate and secure the right of tracking and travelling-ground on the River face of the several grants.

I have the honor to be,

Sir,

Your most obedient Servant,

W. H. MACNAGHTEN,

Secretary to the Governor General.

SIMLA:

The 26th June, 1832.

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No. V.

TO ACTING SECRETARY SUDDER BOARD,

Presidency.

Miscellaneous—Revenue.

SIR,

July 10th, 1832.

I am directed by the Honorable the Vice-President in Council, to call the Board's attention to the accompanying Extract (Para. 10) from a Letter addressed by Captain F. Jenkins to the Military Board, on the 16th April last, submitting observations on the new Canals in the Soonderbuns, &c., and to request, that the Commissioner may be called upon to state whether any and what stipulations have been made with the grantees of waste lands in the Soonderbuns, to secure the right of tracking and travelling-ground on the River face of the several grants.

I am, &c.,

(Sd) J. T.

[*Deputy Secretary to Government.*]

No. VI.

No. 110.

TO THE SECRETARY TO GOVERNMENT,

Revenue Department.

Miscellaneous Department.

SIR,

With reference to Mr. Deputy Secretary Thomason's Letter of the 10th July 1832, calling upon the Sudder Board of Revenue to ascertain and report whether any, and if any, what stipulations have been made with the grantees in the Soonderbuns, to secure to the public the right of tracking and travelling upon ground to be left for those purposes on the River face of the several grants, I am directed to submit for the information of His Lordship in Council, the accompanying Letter from the Commissioner of the Soonderbuns, dated the 22nd ultimo, from which it will be perceived, that no such stipulations have ever been made with the grantees. His Lordship will further observe, that, owing to the peculiar mode of navigating the streams in that tract of country, which is almost exclusively effected by tiding, it is Mr. Dampier's opinion that no such stipulations would be of any public benefit, as far at least as mere water-carriage is concerned.

I have the honor to be,

Sir,

Your most obedient Servant,

ROSS D. MANGLES,

Acting Secretary.

SUDDER BOARD OF REVENUE,

FORT WILLIAM :

The 3rd May, 1833.

No. VI. a.

To R. D. MANGLES, ESQ..

*Officiating Secretary to the Sudder Board of Revenue,
Fort William.*

SIR,

In reply to your Letter of the 16th instant, No. 4, I have the honor to state for the information of the Sudder Board, that no stipulations have ever been made with the Soonderbun Grantees for the right of travelling and tracking ground on the River face of the several grants, nor am I inclined to think such a stipulation would be of any use to the travellers or merchants proceeding through the Soonderbun passages. The whole of the route is through rapid tideways, and the Boats, by quitting at particular times the anchoring places, manage easily to reach the several points where the tide changes, so as to take advantage of each tide, until they pass through the jungle. In the cultivated parts of the passage to the eastward, during the several years that I have been moving about and through it, I have seldom seen laden Boats tracking in the tideway, as they find it better to wait for the flow or ebb as they require to move, than to exhaust their crews in tracking against the stream. In the next place, throughout all the Soonderbun grants which are situated on the eastern route, the Grantees are obliged to raise large bunds to keep out the high spring-tides. These bunds cannot be erected immediately on the banks of the River, as they would be liable to injury from the constant action of the water on them, and it is found that by leaving a portion of land between the bund and the River uncultivated, and with small jungle growing on it, the ground is preserved from the encroachments of the River. If these places are cleared for Roads and tracking-paths, the security which the smaller jungle gives will be lost, and the land exposed to constant encroachment from the River, whilst the navigation of the passage will not be bettered by the measure. The great danger in the Soonderbun passages is from the stems of trees which project from the banks of the jungle-lands, and against which Boats are frequently forced by a sudden gust of wind or an eddy of the tide: as the clearings go on, this will of course entirely cease to exist, and I think it would only discourage the Grantees on the main passages who have been cultivating for several years to demand any new stipulation from them for any purposes whatever.

I have, &c.,

SOONDERBUN COMMISSIONER'S OFFICE,

BAUGUNDY :

The 22nd April, 1833.

(Signed) W. DAMPIER,
Commissioner.

No. XIX.

Act No. XXII of 1836, passed by the Right Honorable the Governor General of India in Council, on the 26th September 1836.

I. It is hereby enacted, that from the first day of November 1836, Regulation VII of 1810 of the Bengal Code, and also such parts of Regulation XVIII of 1806 of the Bengal Code, as relate to the Eastern Canal, commonly called "Tolly's Nullah," which connects the River Hooghly with the Sunderbunds, shall be repealed.

II. And it is hereby enacted, that from the said first day of November 1836, the Governor of Bengal shall be competent to prescribe the amount of Toll, and the mode of levying the same, on boats, rafts and floats, which shall enter on, or pass out of, or through, either of the two lines of navigation hereinafter described—that is to say,

1st. The Eastern Canal aforesaid, from its entry into the Sunderbunds to its junction with the River Hooghly.

2nd. The line made up of the Channel across the Salt-water Lake to Baminghatta, of the Canal leading from the Salt-water Lake to the Boitakhanna Road, and of the new Circular Canal which connects the last mentioned Canal with the River Hooghly.

III. Provided always, that the aggregate amount of Toll levied on account of the whole passage along either of the two lines aforesaid, or on account of entering into, or passing out of, either of the two lines aforesaid, shall in no case exceed one Rupee and a half for every hundred Maunds burden on any boat, or two Annas for every timber, on every raft of timber, or four Annas for every hundred bamboos, on every float of bamboos.

IV. And it is hereby enacted, that the said Governor shall be competent to fix a rate of Rent to be levied on every boat which shall remain in any part of either of the lines aforesaid longer than two days for every hundred Maunds of burden, and on every raft of timber which shall so remain longer than one day for every ten timbers, and on every float of bamboos which shall so remain longer than one day, for every two hundred bamboos.

V. And it is hereby enacted, that the said Governor shall be competent to appoint Officers for the collection of the Tolls and Rent hereinbefore mentioned, and to confer on such Officers, for the purpose of preventing acts whereby either of the said lines of navigation may be obstructed, or whereby the banks along either of the said lines of navigation may be damaged, any or all the powers possessed by Magistrates in respect to navigable Streams and Rivers.

VI. And it is hereby enacted, that whoever wilfully causes any obstruction of either of the said lines of navigation, or any damage to the banks along either of the said lines of navigation, shall be punishable, on conviction before the Magistrate, with imprisonment for a term not exceeding fourteen days, or fine to an amount not exceeding 50 Rupees, or both; and in default of payment of such fine, with additional imprisonment for fourteen days.

VII. And it is hereby enacted, that Notifications of the rates of Toll and Rent, and of the places of collection, and of all Rules made by the said Governor under the authority given to him by this Act, shall be published in the Calcutta Gazette, and exposed to public view at every Toll-house, on either of the said lines in the English, Persian, and Bengallee tongues.

VIII. And it is hereby enacted, that if the Toll or Rent due in respect of any boat, raft or float, on either of the said lines, shall not be paid on demand to an Officer authorized by the said Governor to receive the same, it shall be lawful for such Officer to seize such boat, raft or float, and the cargo thereof, and to detain the same, and if the said Toll or Rent shall have been paid upon any day before the tenth day after such seizure, then the said boat, raft or float, shall be released, or if not paid within the said ten days, it shall be lawful for such Officer with the sanction, and under the directions of the Superintendent of Canals, to sell the property seized, or so much thereof, as the said Superintendent shall direct, for the purpose of satisfying the Toll or Rent which may be due, and also of defraying the expences of seizure and detention; and in every such case, so much of the property seized which has not been sold, and so much of the price of the property sold, as is in excess of the sum necessary for satisfying the Toll or Rent which is due, and for defraying the expences of seizure and detention, shall be returned to the Owner of the boat, raft or float.

IX. And it is hereby enacted, that if any person in charge of any boat, raft or float, shall attempt to evade payment of the Toll or Rent due thereon, or shall resist a seizure made by the authority and under the circumstances hereinbefore described, such boat, raft or float and the cargo thereof, shall be forfeited to the Government under orders of the Superintendent, subject to appeal to the Commissioner of Revenue and Police.

(A True Copy.)

W. H. MACNAGHTEN,
Secretary to the Government of India.

No. XXI.

The following Rules, passed by the Right Honorable the Governor of Bengal, under Act No. XXII of 1836, are published, as required by Sect. VII of that Act, for general information.

RULES FOR THE SUPERVISION AND PRESERVATION OF THE NAVIGATION OF THE CANALS SPECIFIED IN ACT No. XXII OF 1836.

Any person in charge of a Boat or raft neglecting or disobeying the following Rule, viz. That all Boats and rafts lying in the Balliaghatta and Circular lines of Canal be made fast by the head and stern alongside the bank to posts driven into the bank by the Superintendent, and in no other manner.

Any person in charge of a Boat or raft who shall let go an anchor, or place his Boat or raft in such a position as to endanger the safety of other Boats, or obstruct other Boats passing through any of the Canals specified in the above cited Act, any person who shall place obstructions in the Canals aforesaid, or on the roads, drains, or bridges, so as to impede a free passage along them, or to cause injury to them, or who shall commit nuisances by throwing filth on the banks, or into the Canals, or wilfully or negligently permit a Boat to sink in the Canals, will be liable to fine or imprisonment at the discretion of the Magistrate under Section VI of the Act aforesaid.

Any part of the fines imposed and levied by the Magistrate under the above Section may be given to the informer, at the discretion of the Superintendent.

Boats remaining in the Canals more than three months, without authority from the Collector, will be summarily removed.

But the Collector may grant permission to any Boat to remain in the Canals, without paying rent, under certain circumstances and conditions to be noted on the permit.

When a Boat may sink without any blame being attached to the person in charge of it, it will be the duty of the Superintendent of Canals to render every assistance in his power in recovering the Boat and property, without making any charge to the owner.

The Toll-keeper shall, without any unnecessary delay, deliver to any person tendering the amount of toll or rent for any Boat a receipt or ticket for the same, (according to a printed form,) and he will at the same time fill up a duplicate, which duplicates he will deliver to the Collector's peon from day to day.

If any person in charge of a Boat in the Canals shall refuse to show to the Collector his Ticket of admission into the Canal, or state that he has lost it, the Collector is autho-

rized to grant him a renewal of the Ticket, charging one-half toll for such renewal, and if the party cannot satisfactorily prove to the Toll-keeper, (or Collector on appeal,) the date of his entrance into the Canal, and the payment of toll, the renewed Ticket may be antedated one month.

In all disputes arising from trifling differences in measurement of Boats, the Toll-keeper shall decide in favour of the person paying the toll or rent.

(Sd.) R. D. M.

1st November, 1836.

Secretary to the Government of Bengal.

No. XXII.

No. 1588.

TO SECRETARY SUDDER BOARD OF REVENUE

Revenue.

Sir,

The 1st November, 1836.

I am directed by the Right Honorable the Governor of Bengal to request, that you will lay before the Board the annexed Copy of Para. 33, from a Letter addressed to Government by the Canal Committee, under date the 26th ultimo, in order to the introduction of a clause of the nature therein recommended in all future grants of Sunderbun Lands.

2. I am instructed to take this opportunity to inform you, that the Governor has been pleased to transfer from this date, the General, Fiscal, as well as Conservative Superintendence of the lines of Canal specified in Act No. XXII of the current year to the Military Board. Orders on the subject of actual transfer of charge by the Officiating Collector of the 24-Pergunnahs and Calcutta to Captain Thomson, have been issued direct from this Office to the Commissioner of Jessore

I am, &c.,

(Sd.) R. D. M.

[Secretary to the Government of Bengal.]

No. XXII. a.

(Copy.)

Para. 33—"Many of the natural Creeks of the line require tow-paths more urgently than the Canals, and the clearing away of the jungle on their banks is now frequently resisted by the Sunderbun Grantees, who leave a belt of jungle for the protection of their Bunds. The Superintendent will of course look to the mutual benefit of the land-owners and the navigators; but it would be well that all future grants should specify, that the bank of a navigated Channel should, for a certain breadth, be liable to occupation for the purposes of a tow-path or public road."

(A True Copy.)

Secretary to the Government of Bengal.

No. XXXV.

Extract—Letter to the Honorable the Court of Directors, under date the 15th May 1806, in the Revenue Department.

MISCELLANEOUS OCCURRENCES.

Para. 50. From Reports furnished by the Board of Revenue and by the Officer in charge of the Engineer Department it appeared, that considerable repairs were required to be made to the Canal commonly known by the name of Tolley's Nullah, for the purpose of putting it in a good navigable condition, and that without such repairs, it was to be apprehended, that the navigation of the Nullah would, in the course of a short time, be entirely obstructed. The execution of the work was of great importance, not only on account of the Revenue, which Government draws from the Nullah by means of the Toll levied on Boats passing through it, but likewise on account of the convenience which the community derive from this Channel of communication with the Ganges, and the Rivers to the Eastward.

51. The Vice-President in Council accordingly resolved, that the necessary excavations and other repairs should be made to the Canal. It was at the same time determined, that the work should be performed under the immediate directions of the Surveyor to the Magistrates of Calcutta and its vicinity, subject to the general superintendence and controul of the Magistrate officiating in the 24-Pergunnahs.

52. The above-mentioned Officers were accordingly directed, on the 29th of November last, to commence the work, submitting a General Estimate of the expence which would be required for that purpose. The Surveyor was at the same time authorized to draw a Salary of Rs. 300 per month for his services in the performance of that duty.

53. The Estimate required is recorded in the Proceedings of the 13th December last. From a reference to that document your Hon'ble Court will observe, that the computed expence of the excavations and other repairs, founded on the Survey made by the Engineer Officers, amounted to Rs. 1,03,440-7, a sum considerably less than that at which the expence had been estimated by the Officer in charge of the Engineer Department.

54. In order to render the expence to Government as light as possible, the Magistrate was not only directed to employ the convicts in the vicinity of Calcutta in the execution of the work in question, but [an] order was likewise issued for bringing to Calcutta an additional number of convicts for that purpose. By these means it was supposed, that the expence of the repairs might be reduced to nearly half the amount which would otherwise have been required. The Magistrate was accordingly authorized to disburse the sum of Rs. 51,720 in making the repairs, being a moiety of the sum above specified.

55. The repairs are not yet completed; but at the suggestion of the Magistrate, in a Letter recorded in the Proceedings of the 8th of May, we have ordered a survey of the present state of the Nullah, and a report upon the progress made in the projected improvements.

The subject will accordingly be revived in a future Dispatch, when we shall have the honor of stating to your Hon'ble Court the actual expence incurred in the execution of this useful and necessary work. We doubt not that we shall at the same time be able to inform you of a considerable increase in the Revenue derived from the Tolls levied on Boats, in consequence of the improvements made in the navigation of the Nullah.

No. XXXVII.

Extract—Letter to the Honorable the Court of Directors, dated the 29th of June, 1826.

Para. 147. In the 8th Paragraph of our Financial Letter, dated the 31st December 1824, we informed your Honorable Court, in general terms, that, adverting to the heavy pressure upon our Finances, which the war had induced, we had resolved upon the discontinuance of such Public Works as were likely to be productive of any considerable disbursement, unless in those cases where peculiar circumstances should appear to require a partial or total departure from the general rule.

148. This being premised, we shall proceed, in the first instance, to bring to the notice of your Honorable Court the proceedings of the annexed dates, as explanatory of the progress made in two important Departments of Public Works, up to the date of the Resolution in question, and of the measures consequently taken.

149. In the 228th and following paragraphs of our Dispatch, dated the 30th of July, 1823, we informed your Honorable Court that we had constituted a Committee for the general management and controul of the construction of the Canals upon which we had resolved to commence in the vicinity of the Presidency, and of the manufacture of Iron Suspension Bridges; and that we had appointed Captain Schalch, the Executive Officer, for the immediate superintendence of these works, subject to the instructions and orders of the Committee.

150. We beg to refer your Honorable Court to the Proceedings of the annexed dates for information with regard to the progress made in these works by Captain Schalch, previously to the employment of that Officer in duties of a Military nature, and his subsequent departure for the South-eastern Frontier.

151. Early in the year 1824, as your Honorable Court will observe from the Proceedings of the dates noted in the margin, we found it necessary to afford Captain Schalch some assistance in the Iron Bridge Department, and we accordingly appointed Lieutenant Baker of the Artillery, his Assistant, with an allowance of Rupees 500 per mensem, and further, authorized him to retain an European Overseer upon a monthly Salary of Rupees 200. We also authorized the following Establishment:

Rev. Consn.	31st October 1823, No. 23.	An Assistant, ..	100 0 0
" "	24th December " " 25.	12 Overseer (Subordinate), ..	60 0 0
" "	17th January 1824, " 15.	House-rent, ..	60 0 0
" "	12th March " " 38.		
" "	30th April " " Nos. 24 to 25.		
" "	19th November " " 35 and 37.		
" "	25th Ditto " " 11 and 12.		
Rev. Consn.	1st May 1823, No. 33.		
" "	20th February 1824, Nos. 24 and 25.		
" "	25th November " No. 11.		

152. Your Honorable Court will observe that up to the close of 1824, no further progress had been made in the Channel Creek and Diamond Harbour Canal than con-

sisted in surveying and ascertaining the several levels of the country through which it was proposed that the intended line should pass. But the plans and other documents abundantly demonstrate, that the scheme proposed by Captain Schalch is easily feasible, and that the expence, consequent to the undertaking, will not exceed the anticipated amount.

153. In the Eastern Canal some progress had been made in the actual construction of the Work. But Captain Schalch experienced considerable disappointment from the difficulty with which labourers were obtained for the purposes of excavating the soil or clearing the jungle, the indolence of the small number obtainable, and the unusual severity of the rainy season of 1823, which, with reference to the low part of the Soonderbuns to which his operations were principally confined, was a circumstance peculiarly unfavourable. All these impediments, however, appeared to have been satisfactorily surmounted by the zeal and personal activity of Captain Schalch, when His Excellency the Commander-in-Chief required the services of that Officer and of his Assistant Lieutenant Prinsep in the field; and the considerations referred to in Paragraph 147, forbade us to incur any considerable expence in the prosecution of this undertaking. Still we were anxious that, as the Committee had suggested, the original plan should be prosecuted to such an extent as to ensure the early formation of a navigable Channel through the Salt-water Lake, but we were unable to procure a person, out of your service, properly qualified to conduct operations, even upon the modified scale proposed. We were, consequently, compelled, however reluctantly, to determine upon the temporary abandonment of the Canal, which we had anticipated would place the navigation between this City and the Ganges beyond the power of accident or season, and would also open a highly desirable line of communication with the Eastern Districts, and the Forests of the Soonderbuns.

154. Of the Iron Bridges some appeared to be indispensably required. The workmen who had been trained with much trouble, would, if dismissed, have been dispersed, so that we should have lost the benefit of the experience that they had acquired: and adverting to the circumstance that the services of Lieutenant Baker were still available in his Civil capacity, we determined, at the earnest recommendation of the Committee, to keep up the Establishment belonging to the Iron Bridge Yard, and proceed to finish such Bridges as had already been commenced upon.

155. We observe with regret that the expences attendant upon the construction of the piers for the Iron Bridge at Kidderpore have exceeded the Estimate in the sum of Rs. 11,728, but when the unlooked-for difficulties with which Captain Schalch had to contend in the peculiarly unstable nature of the soil, (owing to the site of the work having, at a distant period, been the bed of the Hooghly,) the consequent necessity of sinking shafts to a great depth, and laying the foundation finally, at that distance from the surface, upon wooden piles, as well as the alterations authorized subsequently to the construction of the work, are taken into consideration, we must acquit that Officer of all blame; although in addressing the Committee upon the subject we took the opportunity of impressing upon them the utter worthlessness of estimates, if widely at variance with the actual expence of work. The necessity however for the construction of a Bridge at Kidderpore was such, that we could not have hesitated to undertake it, even had we known, from the outset, that the expences incident to the operation would greatly exceed the sum actually disbursed. We also deemed it expedient to direct that the Bridges under the preparation for the Cuttack Road should be completed and forwarded.

156. The aggregate expence incurred on account of the different works subject to Captain Schalch's superintendence from the commencement of the undertaking to the 31st

Rev. Cons. 24th Dec. 1824, July 1824, when the services of that Officer were required in the No. 20. Military Department, are as follows :—

The new Eastern Canal, ...	1,31,895	0	0
The Diamond Harbour Canal, ...	10,592	0	0
The Ballinghat Canal, ...	5,966	0	0
The Iron Bridge Department, ...	84,023	0	0
The Work Yard, ...	16,585	0	0
Purchase of Land for the new Eastern Canal, ...	1,08,306	0	0
Charges of the Committee's Establishment, ...	18,020	0	0
Total Rupees	3,75,387	0	0

157. The above abstract includes charges of every description. From the first item is to be deducted a sum of Rupees 30,807 on account of five Dredging Boats constructed under Captain Schalch's superintendence for the purposes of the Canal, and subsequently transferred to the Military Department. The same item also includes an outstanding Balance of Rupees 15,844 remaining to be worked off by the workmen employed on the Eastern Canal.

158. Captain Schalch had, your Honorable Court will observe, carried the Canal nearly three miles, at an aggregate expence of Rupees 85,243, giving an average of Rupees 28,414 per mile; and although this charge greatly exceeded the estimate (10,000 Rupees per mile) the difficulties inseparable from the commencement of a novel and arduous undertaking had been overcome, and in the latter stage of operations, the work was conducted within the estimated rate.

159. The Bills submitted by the Committee, and have been passed by us in the Canal and Iron Bridge Departments, including the expence incurred in fitting up a Dredging Boat, are as follows :—

Rev. Consn. 13th February, 1824, Nos. 27 and 28.	Bills Nos. 1 to 40, in the Canal	
" " 12th March, " " 36 and 37.	Department, Rupees	94,596
" " 9th April, " " 34	Bills Nos. 1 to 38, in the Bridge	
" " 7th May, " " 56 and 57.	Department, ...	74,663
" " 4th June, " " 14 and 15.	Bills Nos. 1 to 12, in the Yard	
" " 23rd July, " " 15 and 16.	Department, ...	17,104
" " 26th Nov. " " 13 to 16.		
" " 10th Dec. " " 23		
" " 18th Sept. 1823, " 25		
" " 9th Oct. " " 29 and 30.		
" " 5th March, 1824, " 43 and 44.		

1,86,363

160. It appears to us with reference to the items of the Bills connected with the Iron works, and the heavy general expences inseparable from operations of that nature in this country, that your Honorable Court might be able to procure in England all the Iron works requisite for Suspension Bridges, (which might be forwarded to India in a state ready for immediate erection,) at a smaller present expence, of infinitely superior manufacture, and, consequently of greater durability, than we have been able to command, although heavy charges have been incurred, and the zealous exertions of very able Officers have been directed to the task. It is a singular fact, that whilst the daily wages of handicraftsmen in this country are greatly inferior to those which workmen of the same description obtain in England, the very reverse is the case with respect to piece-work, which the best carpenter or smith in London would undertake at a lower rate, than that at which a workman in Calcutta is willing to engage. Between the quality and workmanship of such articles, and all indeed of a coarse and heavy description, wrought in England and Bengal, there can be no comparison, and we would therefore submit to your Honorable Court (whose means of information upon the subject must be infinitely superior to any that we can pretend to possess,) whether the transmission from London of the same, or the establishment for the construction of the

